INDIA RUBBER WORLD

A BILL BROTHERS PUBLICATION

APRIL, 1949

DU PONT ANNOUNCES

NEOPRENE TYPE RT

A new, improved general-purpose polymer

RETAINS TACK LONGER

RESISTS VULCANIZATE CRYSTALLIZATION

STABILIZED WITH A NON-DISCOLORING ANTIOXIDANT

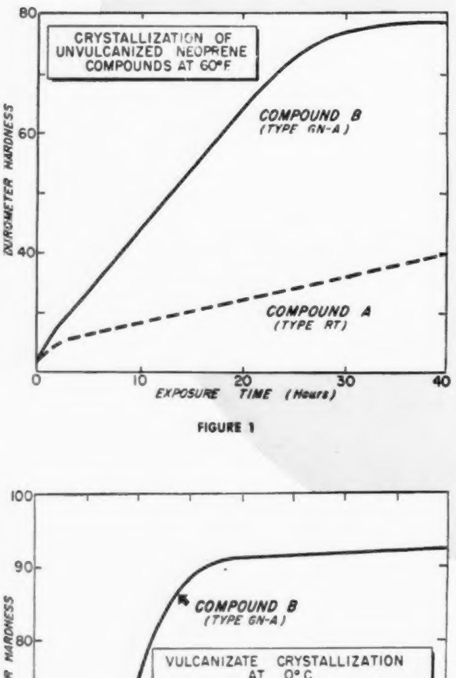

FIGURE 1

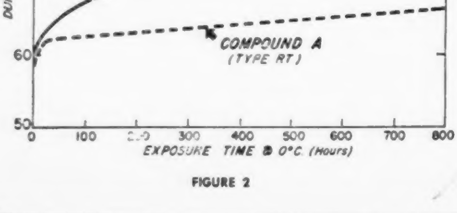

FIGURE 2

COMPOUNDERS will find Neoprene Type RT ideal for friction stocks where its improved tack retention assures excellent ply adhesion. And in roll covering, conveyor cover and sheet stocks, too, it will be found useful. Since Type RT stocks remain pliable, air-trapping during building operations is minimized in these applications.

The stiffening rates of similar Type GN-A and Type RT compounds are compared in Figure I. The retained softness of the Type RT stock correlates well with its improved retention of tack and flexibility.

Vulcanized Type RT stocks, too, resist stiffening even at 0° C.—the critical temperature for crystallization of neoprene. This is shown in Figure 2, which compares the resistance to stiffening of similar Type GN-A and Type RT vulcanizates at 0° C.

Because Type RT contains a non-discoloring antioxidant, it is stable in storage and may be used in stocks where minimum staining or discoloration is required.

Complete information on the use of Neoprene Type RT will be found in Report 49-2. Extra copies are available. Experimental samples on request. Write to:

DU PONT RUBBER CHEMICALS

E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Del.

DU PONT REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY

Tune in to Du Pont "Cavalcade of America," Monday Nights—NBC Coast to Coast

INDIA RUBBER WORLD, April, 1949, Vol. 120, No. 1. Published Monthly by BILL BROTHERS PUBLISHING CORP., Office of Publication, Orange, Conn., with Editorial and Executive Offices at 386 Fourth Avenue, New York 16, N. Y., U.S.A. Entered as Second-Class Matter at the Post Office at Orange, Conn., under the act of March 3, 1879. Subscription United States and Mexico, $3.00 per year; Canada, $4.00; All Other Countries, $5.00; Single Copies 35 Cents. Address Mail to New York Office.

Proven time-and-money-saver for rubber compounders!

Good-rite CHEMICALS RESIN 50

REG U S PAT OFF

Easy-processing stiffening agent for natural and American rubber products

GOOD-RITE RESIN 50 is the first in a new series of high styrene-butadiene copolymers to be developed by B. F. Goodrich Chemical Company.

Its special purpose is to serve as a stiffening agent. But it offers rubber compounders many extra advantages.

For example, when used in the recommended proportions, Good-rite Resin 50

- **gives higher elongation**
- **improves molding and flow characteristics**
- **saves masterbatching**
- **gives lower brittle point and compression sets**

Resin 50 is made as a white, *free-flowing* powder. Its size is such that it will pass a 100 mesh screen. It can be compounded in a wide range of colors. Added to rubber compounds, it also provides a positive reinforcement and a more readily handled compound—because it acts as a plasticizer at processing temperatures.

Good-rite Resin 50 is recommended for shoe soling compounds, floor tiling—has many other possibilities.

Send for complete information—find out how Good-rite Resin 50 may help you produce better products, easier, at lower cost. Please write Dept. HA-4, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

Hycar

Reg U S Pat Off

American Rubber

B. F. Goodrich Chemical Company

A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers

Philodoxical—*Self-assured!*

Philblack A—*The HMF black that knows what he's talking about!*

An immediate commercial success, Philblack A can't be blamed for being proud of his record! Excellent processing qualities, high resilience, good flex life . . . this HMF black is especially valuable for use in tire carcass and mechanical stocks.

Give Philblack A a chance to sell himself to you! Just send for a trial order and see how Philblack A improves your rubber products. This fine-quality black is his own best salesman!

Write for a copy of the brochure "Philblack O and Philblack A in Natural and Synthetic Rubbers." It's just off the press.

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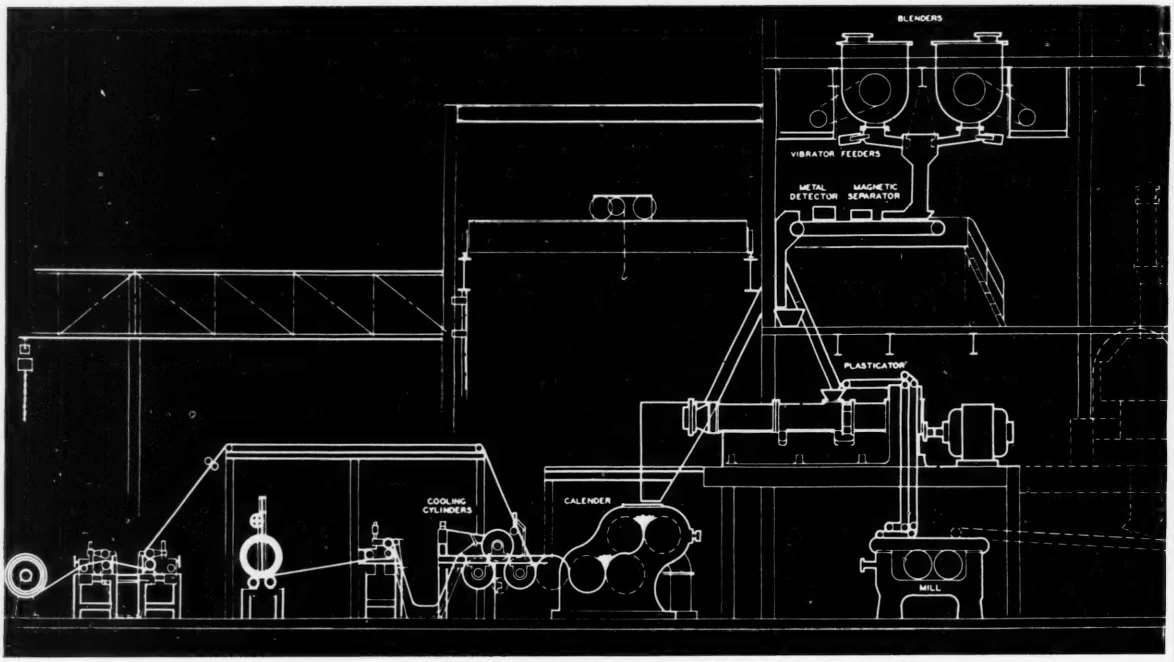

Continuous Plastic Film Calender Train

QUALITY PRODUCTION

Multiple handling and other excessive labor costs have no part in production.

Process engineering for continuity of flow can bring about efficiency through improved quality of product and reduced production costs.

The engineering services of Giffels & Vallet, Inc. are available to the rubber and plastics industry to assist in the improvement of processing in your plant.

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INDUSTRIAL ENGINEERING DIVISION
1000 MARQUETTE BUILDING
DETROIT 26, MICHIGAN

A-C's BUYING GUIDE TO . . .
GUARANTEED NEW AND REBUILT INDUSTRIAL ELECTRICAL EQUIPMENT

AUTHORIZED DEALER

MOTOR GENERATOR SETS (Reconditioned and Guaranteed)

Qu.	KW	D.C. Volts	Make	A.C. Volts
7	2	125v	E.M.	220/440/3/60
5	3	250v	Reliance	220/440/3/60
2	5VS	Drives	Reliance	220/440/3/60
5	5	250v	Reliance	220/440/3/60
2	7½VS	Drives	Reliance	220/440/3/60
5	10VS	Drives	Reliance	220/440/3/60
1	15	125v	Bogue	220/440/3/60
4	15	250v	G.E.	220/440/3/60
5	20	250v	G.E.	220/440/3/60
1	30	115v	Whse.	220/440/3/60 Sq. Cg.
1	30	250v	G.E.	220/440/3/60 Sq. Cg.
2	40VS	Drives	Reliance	220/440/3/60
2	50	250v	C-W	220/440/3/60 Sq. Cg.
1	60	125 or 250	Whse.	440/3/60 (New-syn)
2	60	250v	C-W	220/440/3/60 Sq. Cg.
3	75	250v	C-W	220/440/3/60 Sq. Cg.
1	75	250v	Whse.	220/440/3/60 Sq. Cg.
1	100	125v	A-C	4160/3/60 80% Syn.
1	100	125/250v	A-C	Any/3/60
1	100	250v	C-W	Any/3/60 Syn 100%
1	150	250/275v	G.E.	220/3/60 Sq. Cg
1	170	125v	G.E.	2200/3/60 Sq. Cg.

D. C. CONSTANT SPEED MOTORS, 230 volts (Reconditioned and guaranteed except where shown "New")

1	2	1752	Master	224 (New)
12	3	850/1700	Rel.	23T
5	5	320/534	G.E.	CD93
1	7½	600/1200	E.D.	55
1	7½	850/1700	West.	SK63
1	25	1150	West.	SW103

CONTROLS (new) A. C.

Qu.	Size	Mfg.	Volts	Type
12	1	C-H	220-440-550	Combination
25	2	C-H	220-440-550	Combination
14	3	Clark	440-550	Combination
3	4	C-H	440	Combination
14	2	C-H	220-440	Reversing
2	3	Sq. D.	440	Reversing
3	4	C-H	440	Reversing
2	5	C-H	440	A-C-L 200 HP

CONTROLS (new) D. C.

Qu.	Size	HP	Mfg.	Volts	Type
30	1	3	G.E.	115 or 230	CR 5230
3	1	5	C-H	230	Adj. Speed
4	2	10	A.C.	230	Contact Speed
3	2	10	A.C.	230	Adj. Speed
2	3	10	C-H	230	Adj. Speed—Rev.
2	3	25	C-H	230	Adj. Speed
1	3	25	C-H	230	Adj. Speed—Rev.
1	4	40	C-H	230	Adj. Speed
1	4	40	C-H	230	Adj. Speed—Rev.
2	5	75	C-H	230	Adj. Speed
1	6	150	C-H	230	Adj. Speed

SLIP RING AND SYNCHRONOUS MOTORS

Qu.	Hp.	RPM	Make	Description
1	250	600	Lincoln	220 v IXY, slip ring R & G
1	106KW	1200	Elec. Mach	Syn Gen 80% PF, single brg. R & G
1	50	900	Louis Allis	SR, with automatic controls R & G
1	150	1200	Al. Chal.	440 v. Y826ES SR
1	125	1200	Al. Chal.	440 v. 826D SR
1	60	1200	Al. Chal.	505 SR
1	50	1200	Al. Chal.	505 SR
1	25	900	Al. Chal.	444 SR

A. C. SQUIRREL CAGE MOTORS, 220/440 v., 3 ph., 60 cy. (New except where shown as R&G)

Qu.	HP	RPM	Make	Description
1	200	1200	Al. Chal.	
1	150	1800	Al. Chal.	R&G
1	150	1200	Gen. Elec.	
1	150	900	Al. Chal.	
1	125	1800	Al. Chal.	
1	125	1200	Al. Chal.	
1	125	900	Al. Chal.	

Complete stock of motors, speeds 900 to 1800 RPM, in ratings below 125 HP.

FALK MOTOREDUCERS (NEW)

Size	Ratio
1E2	17.05
2E2	9.139
2E2	17.05
2E3	38.98
3E2	9.272
4E2	9.277
4E3	38.25
5E2	17.59
5E2	9.248
5E3	40.9
6E2	17.51

REDUCED VOLTAGE STARTERS

Qu.	H.P.	Mfg.	Volts	Type
10	15	C-H-G.E.	220-440	R&G
6	25	C-H	220	Primary Resistor-New
9	50	C-H	220-440	New and R & G
4	75	C-H	220	New
3	100	C-H	440	New
4	125	C-H	220	New
1	150	C-H	440	New
2	125	C-H	440	Primary Resistor—New

D. C. ADJUSTABLE SPEED MOTORS 230 VOLTS (Reconditioned & Guaranteed)

3	3/5	1150/2850	Rel.	4IT (New)
3	3/5	1150/3450	G.E.	284
1	3/5	450/1800	G.E.	CD-75
1	5/7½	500/2000	L.A.	ONW-851
2	7½/10	400/1600	G.E.	CD-85
3	7½/10	450/1800	Rel.	92T
2	7½/10	600/1800	Rel.	66T
2	10/15	400/1600	G.E.	CD-95
2	10/15	575/1725	L.A.	ONA-995
5	10/15	575/2300	G.E.	CD-85
3	10/15	400/1350	Marble Card	
5	15/20	400/1200	G.E.	CD-105
1	20/25	400/1200	Electro Dyn.	20S
1	25/30	400/1600	Rel.	262T (New)
3	40/50	250/1500	G.E.	CD1441
1	40/50	350/1050	West.	SK141
2	40/50	400/1500	Rel.	385T
1	50/60	300/900	Electro Dyn.	30S
1	125/150	262/750	G.E.	MPC
1	135/175	450/1200	G.E.	MCF
1	200	300/900	West.	

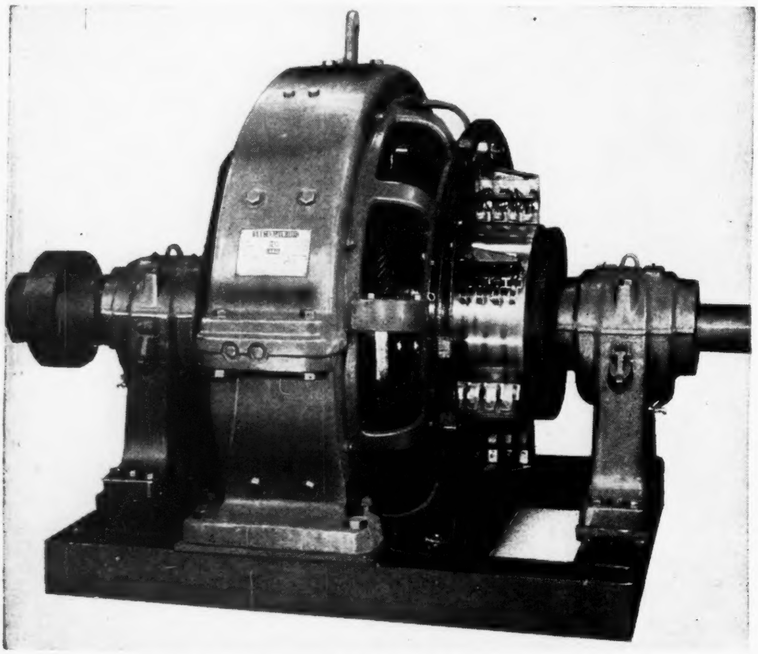
MISCELLANEOUS

1. Falk Steelflex Couplings, Sizes 3F to 18F, available for stock delivery.
2. New P & H Harnischfeger Zip Lift Hoists in stock, 250 to 2000 pound lift, 220, 440 or 550 volt motors.
3. New Robbins & Myers 5000 lb. Type S 3 BG Hoist, complete with hand geared trolley and totally enclosed motor, lifting speed 32 FPM, pendant rope control.
4. Chandesson 5000 amp., 6 volt plating generator set with complete control, synchronous motor drive, 440-3-60.
5. 60 KW, 1500 amp., Anodizing M-G Set, 3/40 volts, any A C voltage, 3 ph, 60 cy. squirrel cage drive.
6. Electro-Products 120.KW, 3000 amp. Anodizing M-G Set, 3/40 volts with complete control and synchronous motor drive.

VARIABLE VOLTAGE CALENDER DRIVES

1 125KW 250v Whse. 200 HP 1160 RPM 2200/3/60 Complete with Exciter, all AC control and 100p circuit controller. 200HP 300/900RPM 250v DC Shunt Wound Motor.

1 150KW 250v DC G.E. 250HP 900 RPM 220/3/60 Complete with exciter, all AC control and loop circuit controller 135/175HP 450/1050 RPM Shunt Wound Motor.



Westinghouse 200 HP, 300/900 RPM, 230 volt DC, Sleeve Bearing Motor, also complete starting equipment for this motor available in our stock.

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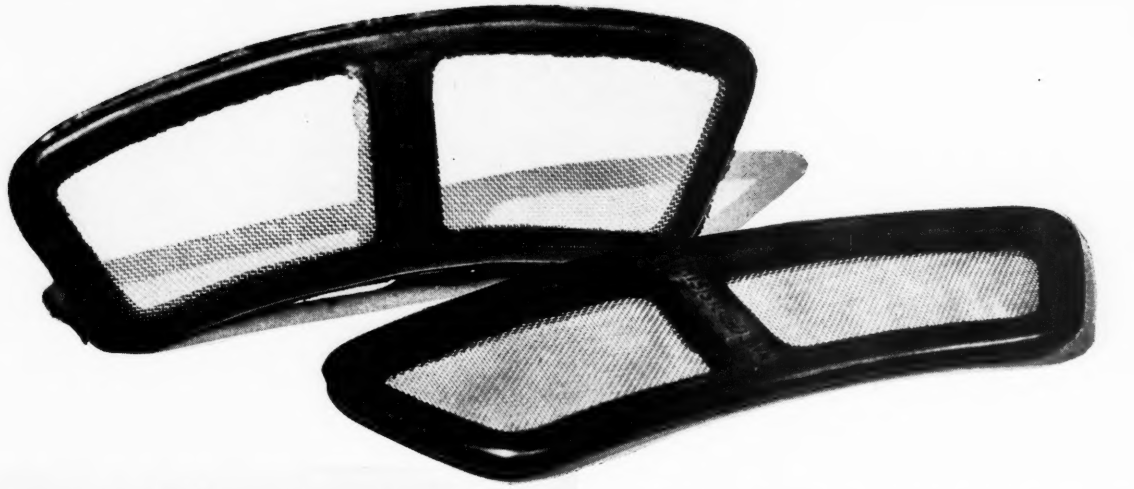


for stiffness that means

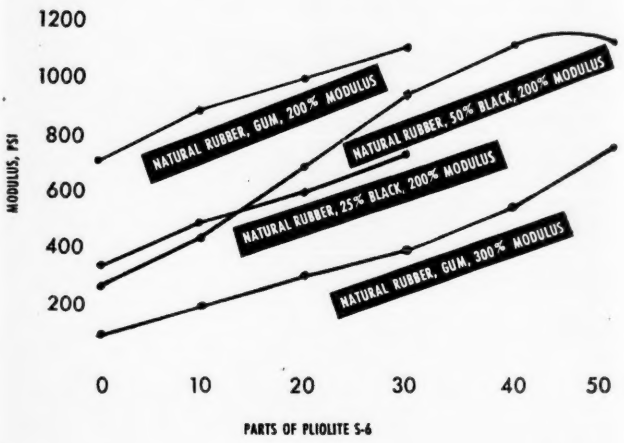
Easier Fabrication
Longer Product Life

Specify

PLIOLITE S6

EFFECT OF PLIOLITE S-6 ON NATURAL RUBBER

The stiffness of gum and black natural rubber stocks, as measured by 200% modulus, is increased by addition of **Pliolite S-6.** Gum stock plus 25 parts **Pliolite S-6** equals stock with 25 parts black in modulus. Chart shows relative change produced by additional parts of **Pliolite S-6.**



You can fortify the natural toughness of rubber with the stiffness required for fabrication and longer end-product use by employing **Pliolite S-6** in your compounds. The chart shows how effectively **Pliolite** copolymer resins bring added stiffness required by such fabricated parts as washing machine strainers as well as to many extruded items such as hydraulic and steam hose gaskets and to molded parts in a wide range of sizes and shapes.

Besides adding stiffness, **Pliolite S-6** also increases hardness and tensile. The light color of this resin makes it ideally suited for the reinforcement of light colored stocks. You will find **Pliolite S-6** well suited for all applications needing a light color, low gravity stock of 70 to 100 durometer hardness with good processability and marked moldability.

In addition to reinforcing GR-S rubber as in the item pictured, **Pliolite S-6** can be very effectively used to stiffen, harden and improve the processing of natural, Buna N and Neoprene rubber stocks.

You can get **Pliolite S-6** in a powder for your own mixing, or in master batches. For complete information and sample, write: Goodyear, Chemical Division, Akron 16, Ohio.

USE PROVED Products

GOODYEAR

Pliolite—T.M. The Goodyear Tire & Rubber Company

CARBON BLACKS

UNITED CARBON COMPANY, INC.
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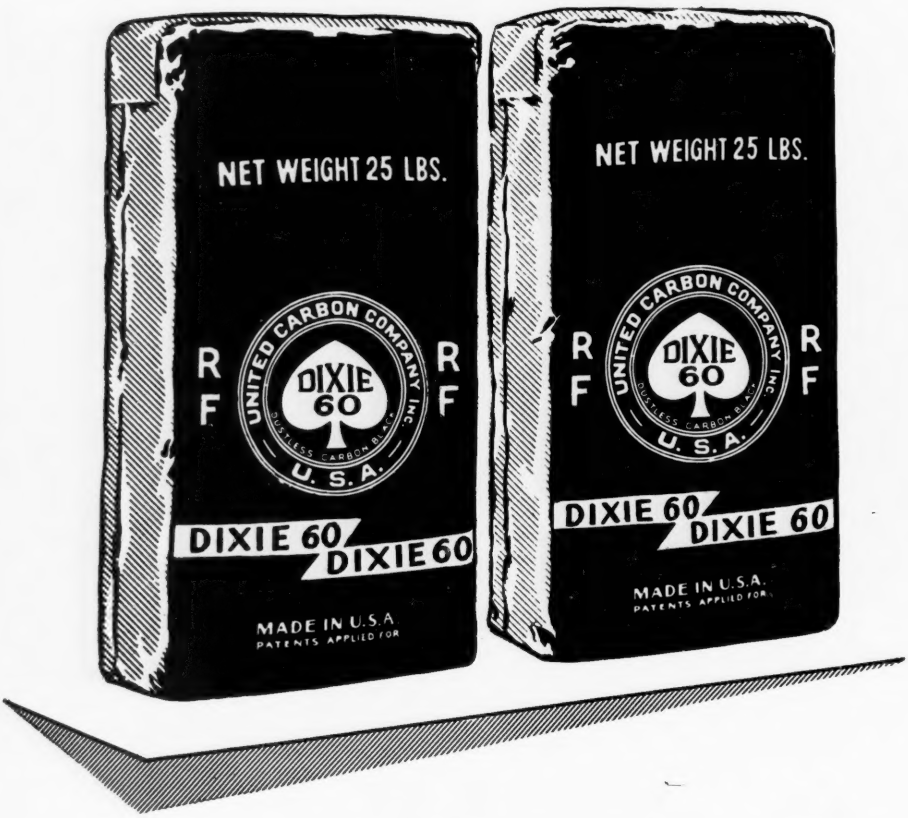

That's Right!

The new DIXIE 60 . . . our reinforcing furnace (RF) black . . . is a pillar of strength and a symbol of ultra-resistance to abrasion. The superior processing by which the old DIXIE 60 was known world wide is fully retained in the new DIXIE 60. For extra advantages in road performance, compound your tires with DIXIE 60.

P. S. Bags are printed with yellow ink for ready identification.

DIXIE 60

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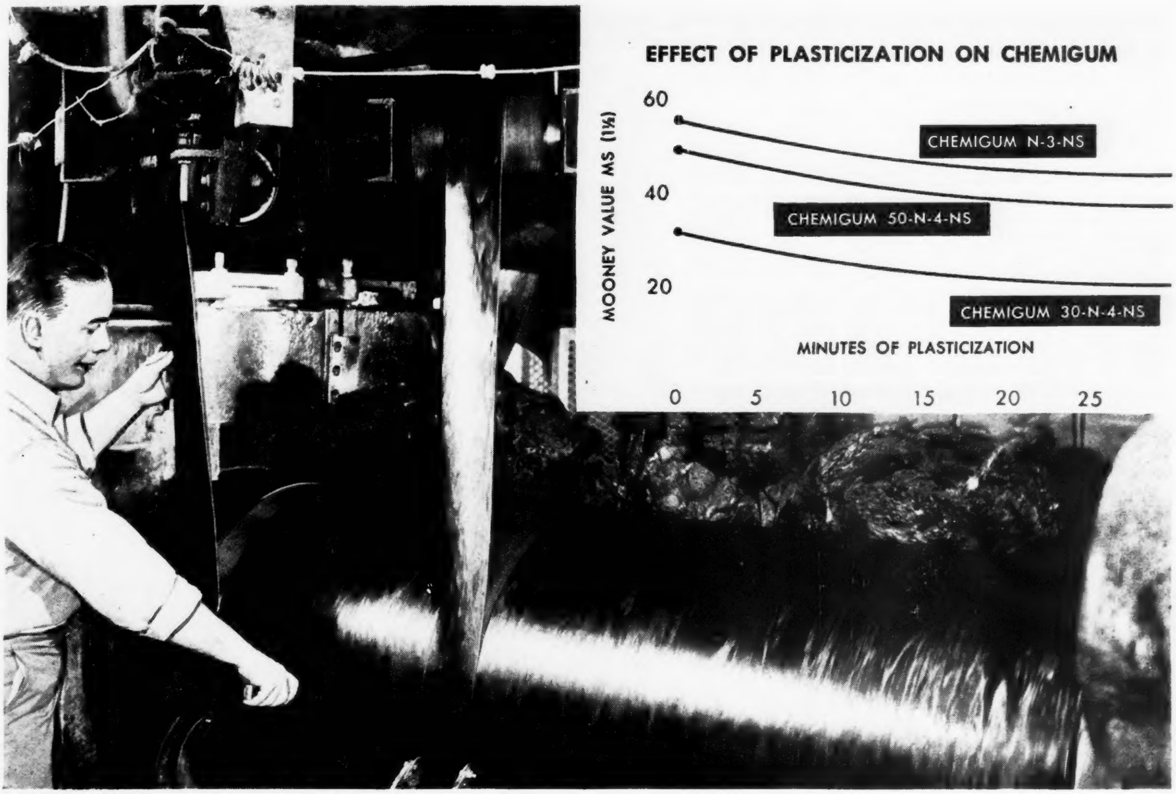

Chemigum is easier to mill, reducing batch time

For easier processing compounds

Use CHEMIGUM

CHEMIGUM oil resistant rubbers give you outstanding processing characteristics. These Goodyear synthetics *do not toughen or harden* with prolonged heat and mastication on a mill or in a Banbury. *They actually tend to soften in processing* – need no special compounding techniques.

In addition to this ease of processing, the **Chemigum** rubbers have all of these unique properties:

EXCELLENT OIL RESISTANCE
LOW SWELL IN AROMATIC SOLVENTS
GOOD PHYSICAL PROPERTIES

They are well stabilized against effects of light and age with non-staining anti-oxidants which permit their use in light-colored stocks.

Chemigum N-3-NS has higher acrylonitrile content, giving it excellent oil resistance and ready processability. **Chemigum 30-N-4-NS** is a softer rubber ideally suited for extrusion, and **Chemigum 50-N-4-NS** is a tougher rubber recommended for molded products. All three forms of **Chemigum** are compatible with vinyl resins and can be used to replace and extend scarce plasticizers. For details, write Goodyear, Chemical Division, Akron 16, Ohio.

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USE PROVED *Products*

GOODYEAR

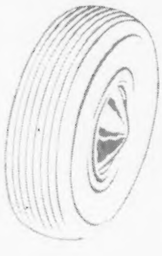
Chemigum (pronounced Kem-e-gum)—T.M. The Goodyear Tire & Rubber Company

For white and light colored rubber:

TITANOX-RA

(rutile titanium dioxide)

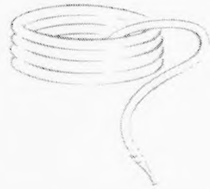
— imparts maximum brightness and tinting strength with minimum pigmentation.



TITANOX-A

(anatase titanium dioxide)

— imparts maximum whiteness with low pigmentation.



TITANOX-RCHT

(rutile-calcium; 30% TiO_2, 70% $CaSO_4$)

— imparts maximum whiteness and brightness at higher pigmentation.

TITANOX pigments are ideal whiteners and brighteners for rubber because of high refractive index coupled with optimum particle size. Their physical and chemical stability make them compatible with natural and synthetic rubbers as well as compounding ingredients.

Our Technical Service Laboratory will be glad to help you with any pigmentation problem. Call or write our nearest office. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; 104 So. Michigan Ave., Chicago 3, Ill.; 2600 So. Eastern Ave., Los Angeles 22, Calif. Branches in all other principal cities.

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the brightest name in pigments

TITANIUM PIGMENT CORPORATION

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7215

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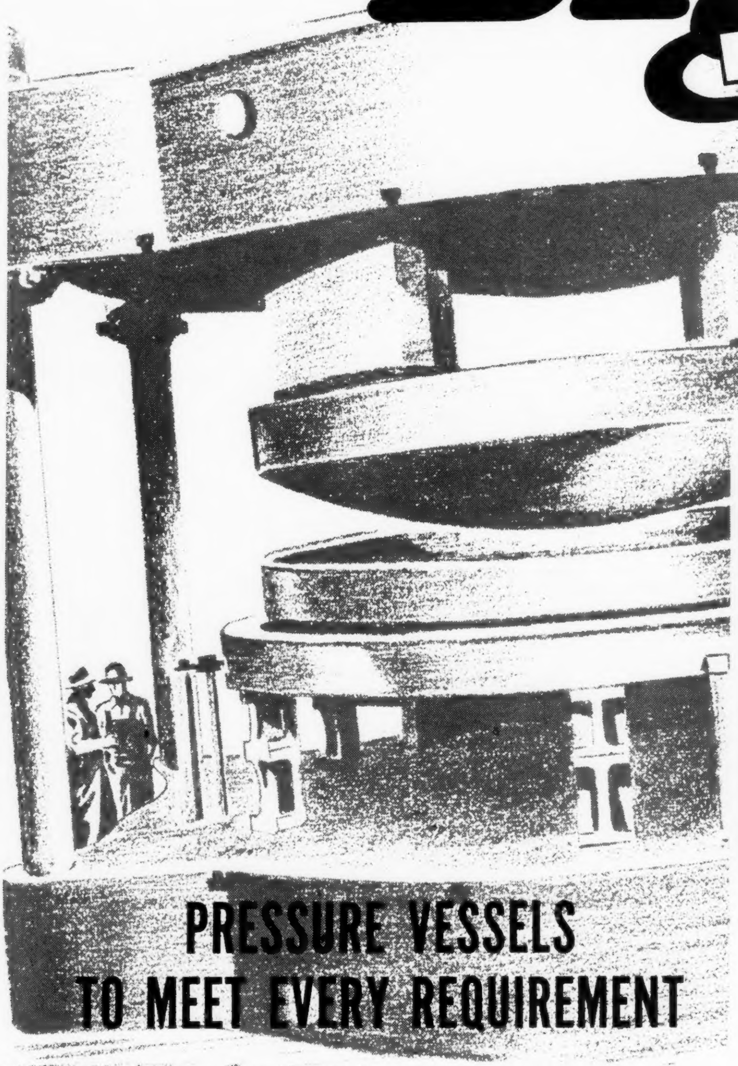
...that's Biggs

ESTABLISHED 1887



POT VULCANIZER
with quick-opening door

PRESSURE VESSELS TO MEET EVERY REQUIREMENT

The rubber industry relies on vulcanizers and de-vulcanizers "built by Biggs". This is a logical outcome of our half-century of specialized experience in heavy plate assemblies, and our progressive research in fabricating with Nickel, Monel, Inconel, Stainless Steel, as well as all clad metals — to lengthen life of equipment and safeguard products.

Biggs' modern and complete plant facilities and long technical experience are yours to command or consult . . . Simply write, phone or wire the Akron Office. Our field representative will call to discuss your problem of fabrication for your requirements.

The Biggs Boiler Works Co. Est. 1887 Akron Ohio

PRODUCTS BY BIGGS WELDED TO CODE REQUIREMENTS

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CARBON STEEL • SPECIAL STEEL
SPECIAL ALLOYS and CLAD METALS

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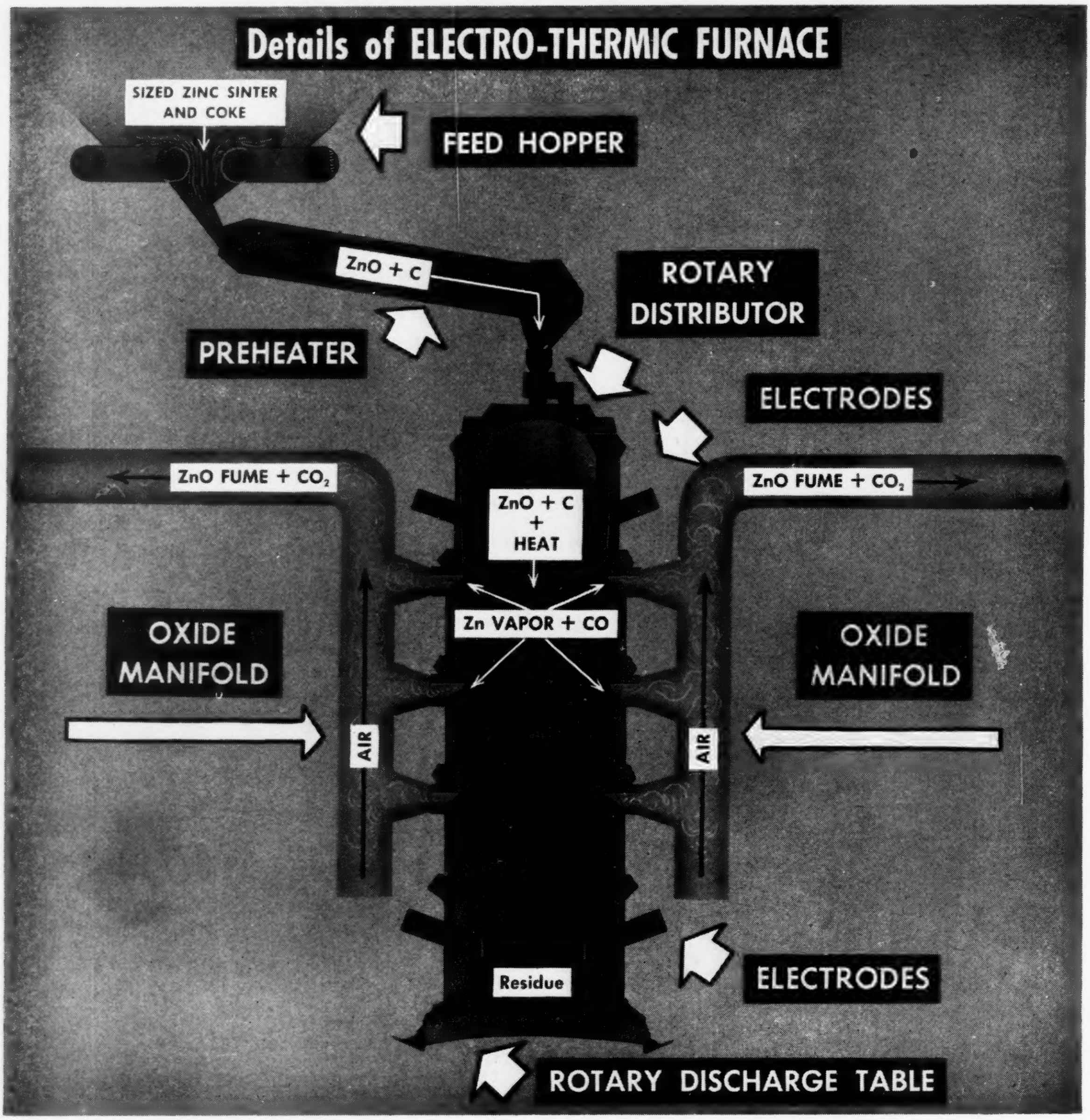
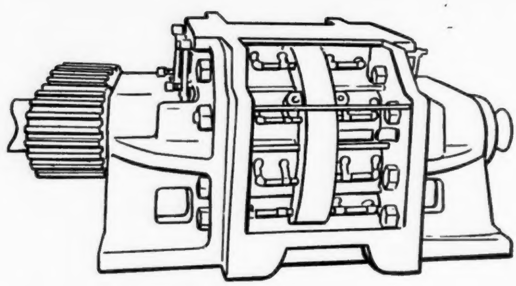
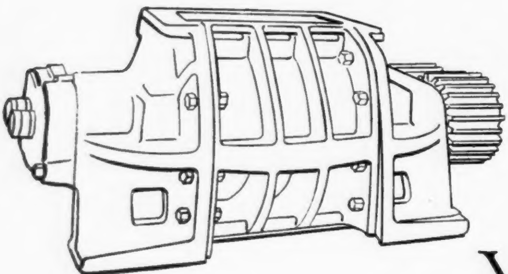


Details of ELECTRO-THERMIC FURNACE
SIZED ZINC SINTER AND COKE
FEED HOPPER
ZnO + C
ROTARY DISTRIBUTOR
PREHEATER
ELECTRODES
ZnO FUME + CO$_2$
ZnO FUME + CO$_2$
ZnO + C + HEAT
Zn VAPOR + CO
OXIDE MANIFOLD
OXIDE MANIFOLD
AIR
AIR
Residue
ELECTRODES
ROTARY DISCHARGE TABLE



You Don't Need a Crystal Ball to tell you



YOU know that your Banbury mixer will need rebuilding, sooner or later . . . maybe now.

You know that rebuilding means lost production while the mixer is down.

Now, if you would like to *cut* that lost time in *half*, ask us about our "Pre-Plan" Rebuilding Service.

The rebuilding will be thorough, precision work, developed through our 15 years' specialized experience. It includes our exclusive hard-surfacing process, and our exclusive design, standard-dimension rings, absolutely guaranteed to stop dust leakage.

Your Banbury will be back in tip-top condition, ready to give highest mixing efficiency over longer periods of sustained operation.

Write for details NOW, save yourself lost time and money later on.

Many Rubber Plants have entrusted all Banbury body rebuilding to us for years — some ever since we started business 15 years ago.

Interstate-rebuilt Banburys are performing with full satisfaction in plants all over the United States, and in foreign countries, too.

SERVING THE RUBBER INDUSTRY

IWS

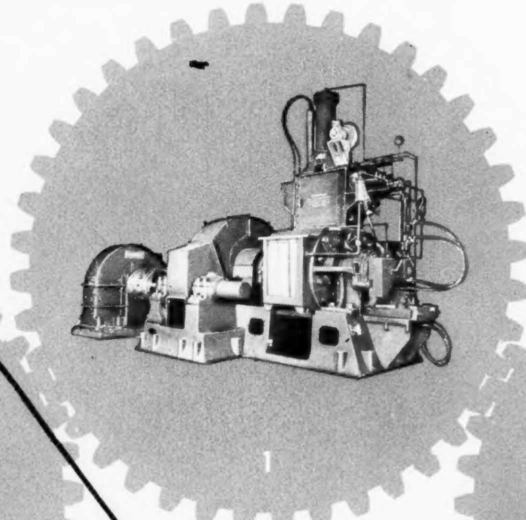
INTERSTATE WELDING SERVICE

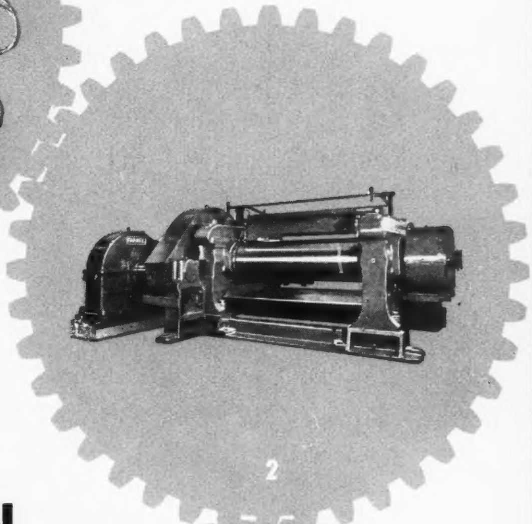
Main Plant: 914 Miami Street . . . AKRON 11, OHIO . . . Phone: JE 7970

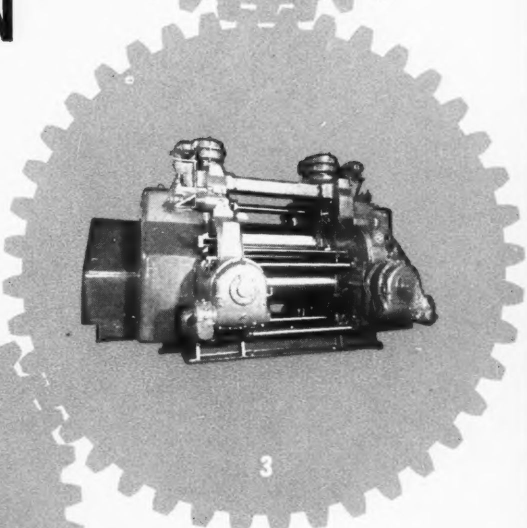
EXCLUSIVE SPECIALISTS IN BANBURY MIXER REBUILDING

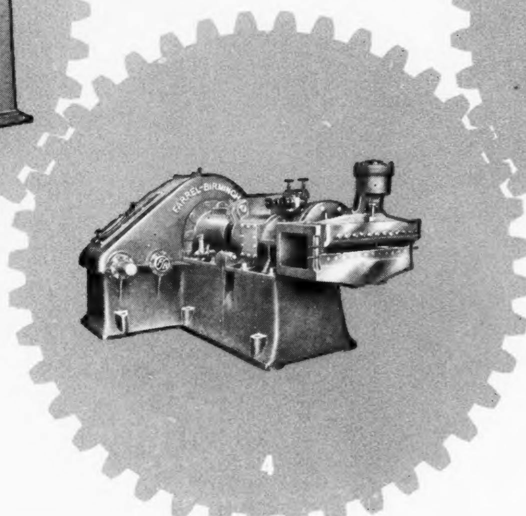
a s

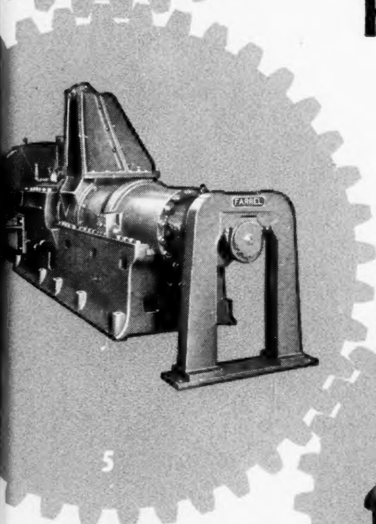
MATCHED PRODUCTION UNITS

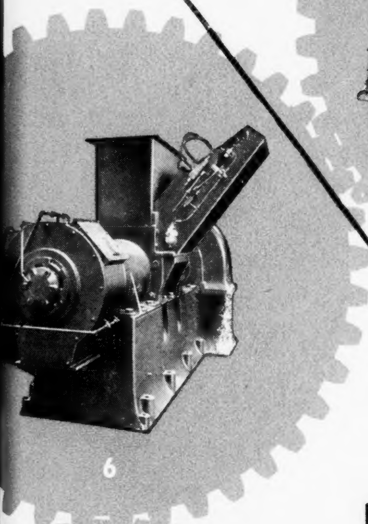












Farrel-Birmingham

FB-322

How to make a *stronger bond* between rubber and fabric

MORE STRENGTH HERE. Pre-treatment of the tire fabric with Resorcinol Adhesives in the latex mixture assures a stronger bond between the fabric and the tread.

TIRES, belting and other products which include laminations of rubber and fabric or cords are serviceable only as long as the parts hold together. To obtain best adhesion of rubber to fabric or cords, it is common practice to pre-treat the fabric in a mixture of rubber latex and some adhesive material. For this purpose adhesives prepared with Koppers Resorcinol are proving highly successful.

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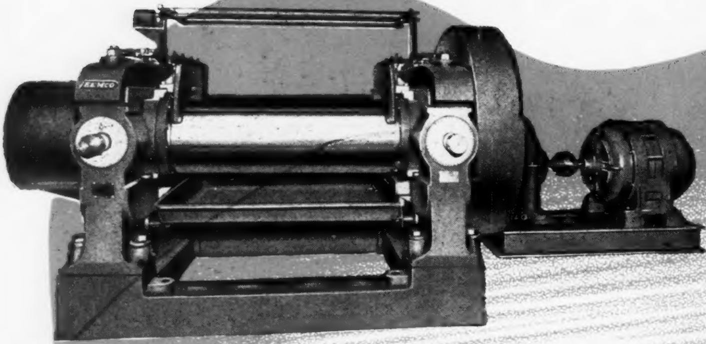

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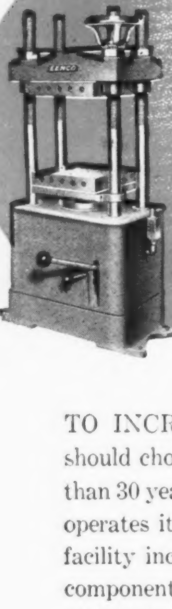

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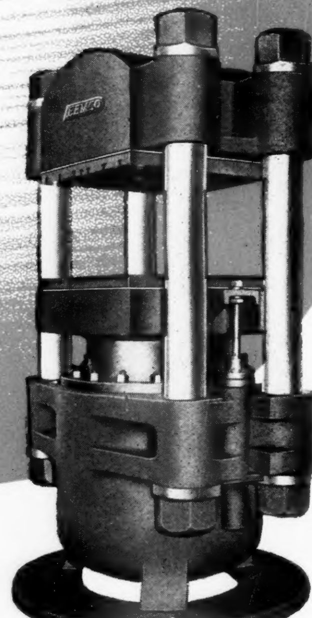

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43	Working Capacity—Gallons / Trough Dimensions—Inches / Maximum Horsepower Input			½ / 8¾ x 7 / 60 H P
35	Working Capacity—Gallons / Trough Dimensions—Inches / Maximum Horsepower Input			¼ / 7 x 5¾ / 20 H P
28	Working Capacity—Gallons / Trough Dimensions—Inches / Maximum Horsepower Input			⅛ / 5¾ x 4½ / 15 H P

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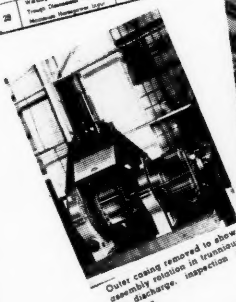
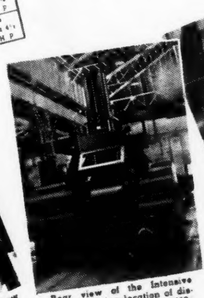
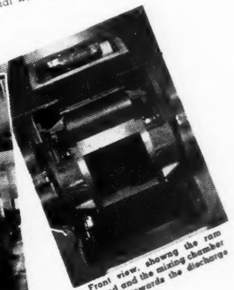


Outer casing removed to show assembly rotation in trunnions for discharge, inspection or cleaning.



Rear view of the Intensive Mixer showing location of discharge motor. 27 gal. 200-400 H. P.



Front view, showing the ram raised and the mixing chamber rotated towards the discharge position.

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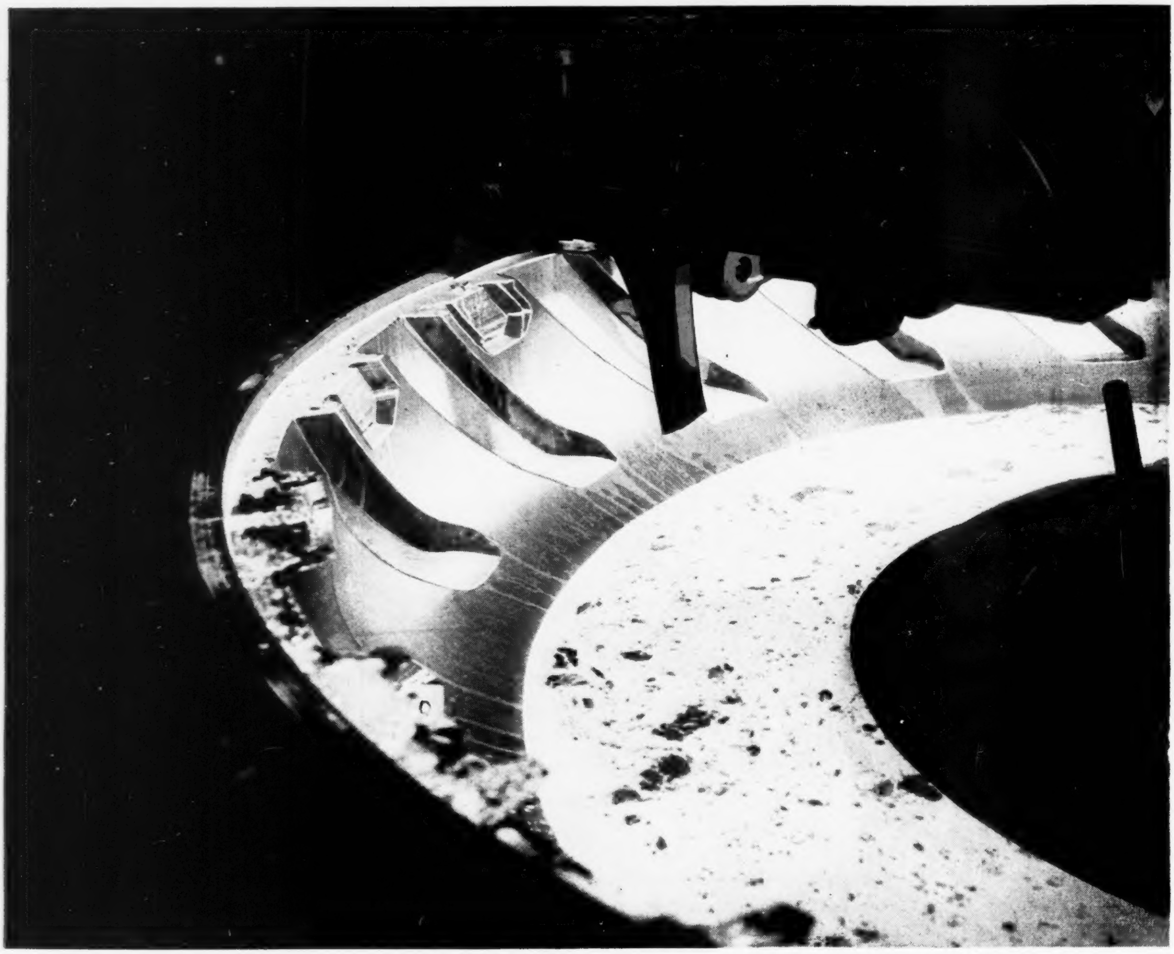

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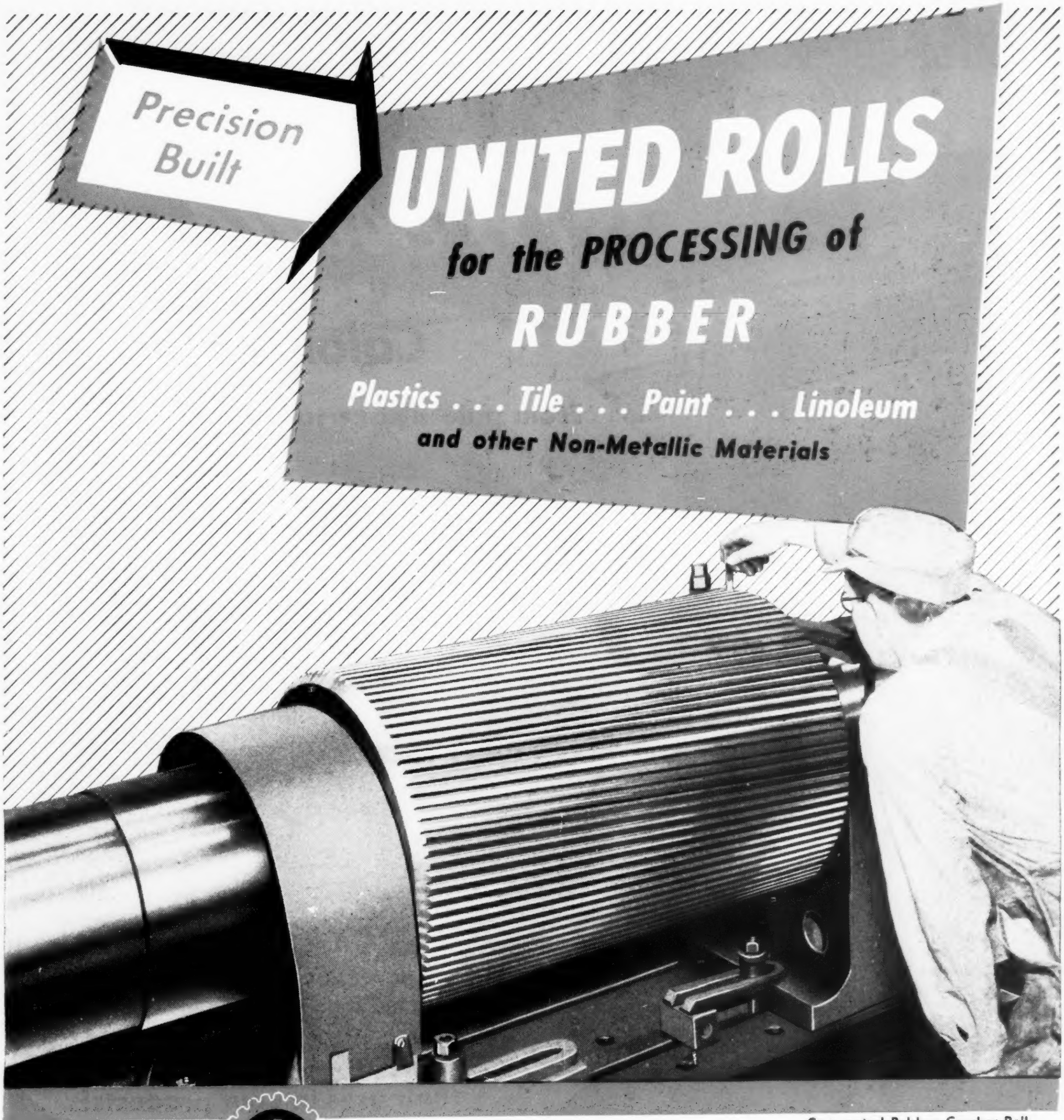

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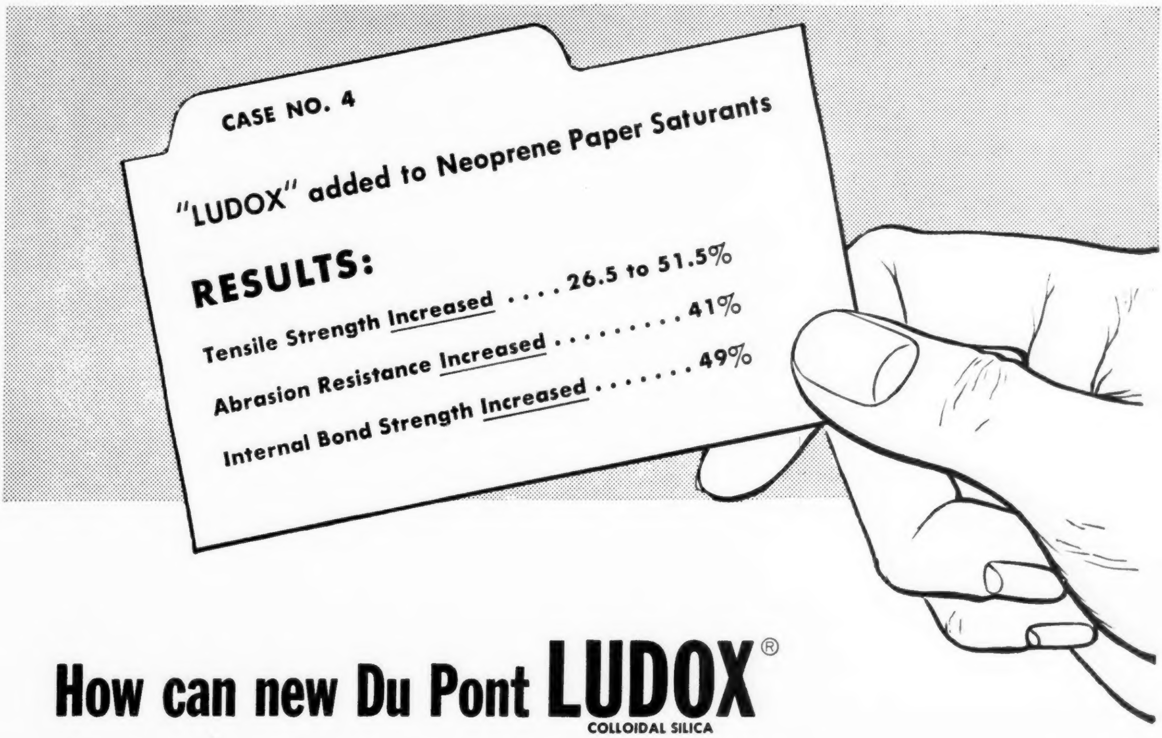

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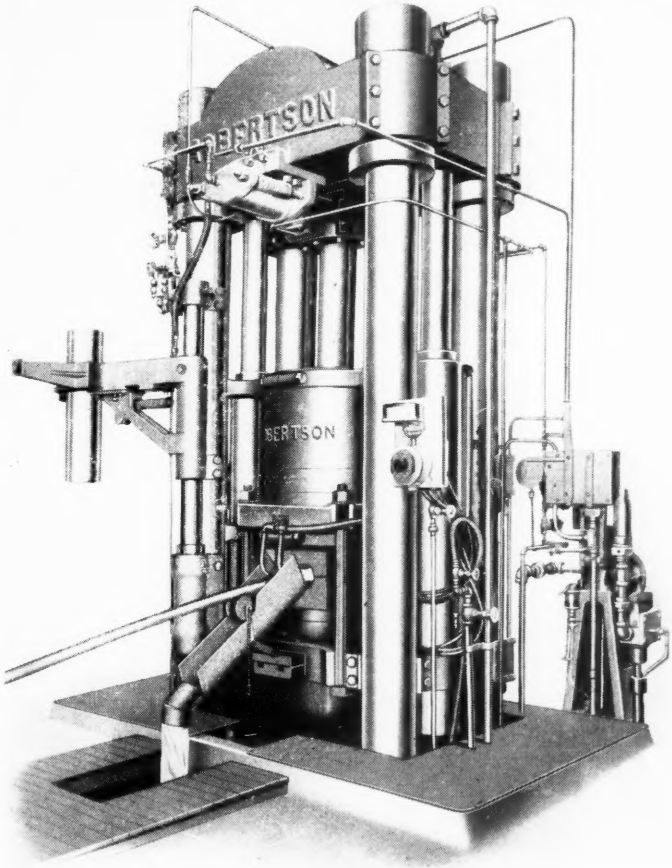

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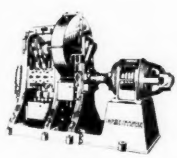

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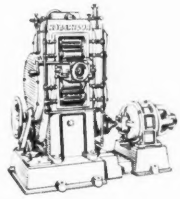

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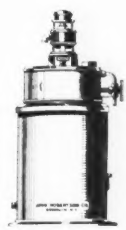

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RUBBER WORLD

Volume 120 | New York, April, 1949 | Number 1

Power Consumption Studies on Natural and Synthetic Rubber Compounds[1]

A. H. Nellen,[2] Wm. B. Dunlap, Jr.,[2] and C. J. Glaser, Jr.[2]

DURING the past 10 to 12 years the greatly increased consumption of carbon blacks and of the various types of synthetic rubbers for tire manufacturing has resulted in higher average power requirements and increased power cost per pound of production. Processing equipment which had previously operated at loads well under capacity for crude rubber has now approached or exceeded rated motor capacity.

Relatively little technical data have been published in rubber literature on tire industry power requirements. Shoaff[3] has shown the effect of roll speed, friction ratio, etc., on power input to open mills and has compared power requirements of mills and Banbury mixers. Young[4] has discussed the effect of machine design on power requirements.

Preliminary work in the plant of the Lee Rubber & Tire Corp. on low-temperature 41° F. cumene hydroperoxide copolymers GR-S, X-435 and X-485, which to date have been produced at higher Mooney levels than standard GR-S, indicated the necessity of carefully investigating power requirements. This work was later amplified to include the effect of certain types of carbon black, the effect of plasticizer and plasticizer black ratio, and finally the effect of mixing variables.

A basic study was made in Lee laboratories on a laboratory B size Banbury, and the work continued under actual factory conditions in standard #11 Banburys. A recording wattmeter was used to determine the power requirements. The charts were measured with a planimeter to determine the area under the curve for each batch or breakdown cycle.

Effect of Type of Hydrocarbon

The effect of type of hydrocarbon was determined as the primary basis of comparison. GR-S, X-435, standard GR-S, and smoked sheets in bale form, and standard GR-S and smoked sheets which had been premasticated in a Gordon plasticator were broken down in a laboratory Banbury. A batch size of 800 grams was used. The speed was 155 r.p.m. and the motor rating, 17 h.p. The results of this comparison are shown in Table 1. The order of relation was as expected with GR-S X-435, giving the highest power consumption, followed by standard GR-S and smoked sheets, with plasticated standard GR-S and smoked sheets at still lower values respectively.

TABLE 1. POWER CONSUMPTION ON ·XING—NATURAL AND SYNTHETIC RUBBERS

Stock	Hydrocarbon	Total Watts Consumed
1	GR-S X-435, bale	210
2	Standard GR-S, bale	170
3	Smoked sheets, bale	110
4	Standard GR-S, two-pass plasticator	60
5	Smoked sheets, two-pass plasticator	40

Effect of Type of Black

Three types of black were incorporated into GR-S X-435 and smoked sheets. Representative blacks were chosen of the following general types: EPC, FF, and HAF. These batches were given two mixing cycles at 155 r.p.m. of 3.5 and 3.0 minutes respectively. Power consumption indicated definite trends, but was not considered reliable because the mixes were so dry that the stock crumbled in the Banbury. The work was repeated, including stearic acid and oil in batch, as shown in Table 2. It is of interest to note changes in relation of blacks, depending on which of the two hydrocarbons was used.

TABLE 2. POWER CONSUMPTION ON MIXING—EFFECT OF DIFFERENT TYPES OF CARBON BLACK

Compound No.	1	2	3	4	5	6
GR-S X-435 bale	700	700	700	...	...	...
Smoked sheets bale	....	....	...	700	700	700
EPC Black*	...	350	...	...	350	...
FF Black†	350	...	...	...	...	350
HAF Black‡	...	...	350	350	...	...
Stearic acid	14	14	14	14	14	14
Oil	42	42	42	42	42	42
TOTAL	1106	1106	1106	1106	1106	1106
Watts consumed 1st cycle	440	420	350	290	280	160
2nd cycle	391	402	400	150	50	100
TOTAL	831	822	750	440	330	260

*Cabot 9.
†Binney & Smith Statex B.
‡Philblack 0.

[1] Presented before the Division of Rubber Chemistry, A. C. S., Chicago, Ill., Nov. 8, 1948.
[2] Lee Rubber & Tire Corp., Conshohocken, Pa.
[3] *Rubber Age* (N. Y.), 23, 3, 142 (1928).
[4] *India Rubber J.*, 65, 10, 405 (1923).

TABLE 3. POWER CONSUMPTION ON MIXING—FACTORY SCALE—POLYMERS AND BLENDS, BLACKS AND BLENDS

Stock	Hydrocarbon	Black	First Cycle Min.	First Cycle R.P.M.	First Cycle KW	Second Cycle Min.	Second Cycle R.P.M.	Second Cycle KW	Third Cycle Min.	Third Cycle R.P.M.	Third Cycle KW	Total KW	KW per Lb.
1	Smoked sheets, two-pass plasticator	50 HAF	8	30	22.61	5	30	17.40	...	...	...	40.01	100
2	Smoked sheets, two-pass plasticator	30 HAF 20 FF	8	30	20.48	5	30	8.88	...	...	...	29.36	.073
3	Smoked sheets, two-pass plasticator	47.5 EPC	8	30	14.44	5	30	14.22	....	...	...	28.66	.072
4	GR-S, two-pass plasticator	40 HAF	8	40	25.64	5	30	15.69	5	30	17.55	58.88	.147
5	GR-S, two-pass plasticator	40 EPC	8	40	22.98	5	30	14.57	5	30	13.33	50.88	.124
6	Std. GR-S X-435 50/50 two-pass plasticator	25 HAF 15 EPC	8	40	30.31	5	30	8.76	...	...	...	39.07	.098

TABLE 4. POWER CONSUMPTION ON MIXING—EFFECT ON OIL—BLACK RATIOS

Stock	Hydrocarbon	Black	Plasticizer	First Cycle Min.	First Cycle R.P.M.	First Cycle KW	Second Cycle Min.	Second Cycle R.P.M.	Second Cycle KW	Third Cycle Min.	Third Cycle R.P.M.	Third Cycle KW	Total KW	KW per Lb.
1	GR-S X-435, bale	50 HAF	6.5 Oil	6	40	15.27	6	40	14.04	5	30	14.75	44.06	.126
2	GR-S X-435, bale	50 HAF	10.0 Oil	6	40	13.39	6	30	16.12	5	30	9.48	38.99	.114

The FF type of black required the highest power input in GR-S X-435 and the lowest in smoked sheets. Conversely, HAF black required the highest power input in smoked sheets and the lowest in GR-S X-435. It would seem from this statement that factors other than particle size are determinant in power requirements.

In order to confirm the laboratory results tread-type compounds were mixed in a #11 Banbury. These were completely compounded, but, for the purpose of this report, only the black variables are shown. The results clearly show, Table 3, that substantial reductions in power consumption can be accomplished by judicious blending of blacks and the use of blended blacks in blended polymers. The substitution of FF for part of the HAF black in a natural rubber tread gives a substantial reduction in power. A blend of polymers and a blend of blacks permits the omission of one mixing cycle, yet gives a compound which will extrude as smoothly as a standard GR-S tread with an extra mixing cycle and again a substantial reduction in power. This comparison includes a common-type natural rubber, channel black tread which can be assumed to represent average power requirements that existed prior to World War II.

Effect of Plasticizers

Preliminary laboratory work conducted on the same basis as that previously mentioned for blacks has indicated that various types of plasticizers and plasticizer combinations have an important bearing on power requirements. Factory work has not been completed, and the data are considered insufficient to report at this time.

Table 4 shows the effect of two different oil-black ratios on power consumption.

Effect of Mixing Variables

The first factory mixing of GR-S X-435 polymer with HAF black reinforcement resulted in excessively high overload peaks, particularly on the second and third mixing cycles. This condition was particularly true on Banburys with 500 h.p. motors and also true to some extent on Banburys with 600 h.p. motors. Overload peaks of 50 to 60% were experienced, and on several occasions the Banburys (500 h.p.) were stalled. Repeated overloads on short-cycle batches of this magnitude would greatly reduce motor life and result in overheating of the transformers.

Time and sequence of black addition were found to be extremely important. The addition of all of the black on the first cycle resulted in extremely high power consumption on first and second cycles, with very high peak overloads on second and third cycles. Equal division of black between the first two cycles reduced power consumption appreciably, but did not eliminate overload peak to any great extent. Delaying the black addition by one minute in the second cycle permitted the peak caused by loading of the masterbatch to dissipate to some extent before the black was added, resulting in peak demands which were within the limits of a 600 h.p. motor, but still exceeded the limits for a 500 h.p. motor.

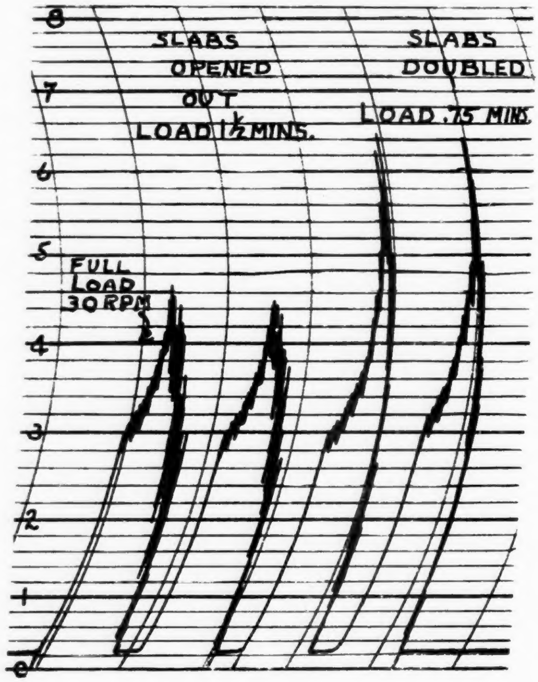

Fig. 1. Effect on Power Consumption of Doubled *vs.* Opened Slabs of GR-S X-435 Stock

It was also found that method and time of loading of the masterbatch for the third cycle of the mix in which there was no black addition was a definite factor in reducing peak loads. In normal practice, slabs are folded several times to clear the door of the Banbury conveniently, and loading is accomplished in 0.75-minutes. Peak overloads averaging 60% were experienced. Slabs of masterbatch were opened out and fed in lengthwise with loading period extending to 1.5 minutes. By this method overloads were reduced to 12% or under. This point is best illustrated by the actual chart as shown in Figure 1.

Table 5. Effect of Mixing Variables on Power Consumption

Stock	Hydrocarbon	Black	Mixing Variable	First Cycle Min.	First Cycle P.R.M.	First Cycle KW	Second Cycle Min.	Second Cycle R.P.M.	Second Cycle KW	Third Cycle Min.	Third Cycle R.P.M.	Third Cycle KW	Total KW	KW per Lb.
1	GR-S X-435, bale	50 HAF	All black in on first cycle	6	40	18.58	6	30	20.00	5	30	17.51	56.09	.160
2	GR-S X-435, bale	50 HAF	½ black added on first and second cycles	6	40	14.62	6	30	17.10	5	30	16.98	48.70	.139
3	GR-S X-435, bale	50 HAF	Delay in black addition second cycle	6	40	14.62	6	30	14.87	5	30	16.59	46.08	.132
4	GR-S X-435, one-pass plasticator		Black as in No. 2 above	6	40	18.74	6	30	18.35	5	30	17.75	54.84	.157
5	GR-S X-435, two-pass plasticator		Black as in No. 2 above	6	40	18.74	6	30	17.19	5	30	18.08	54.01	.154
6	GR-S X-435 50 / Std. GR-S 50 two-pass plasticator		Black as in No. 2 above	6	40	15.98	6	30	14.50	5	30	10.02	40.50	.116
7	Std. GR-S, two-pass plasticator	40 HAF		8	40	25.64	5	30	15.69	5	30	17.55	58.88	.147
8	Std. GR-S, three-pass plasticator	40 HAF		8	40	27.82	5	30	17.26	...	...	...	45.08	.113

Table 6. Mooney Viscosity-vs. Power Consumption for GR-S X-435 Bale, 50 HAF Black

Compounded Mooney Viscosity RRC Formula	KW Cycle First	KW Cycle Second	KW Cycle Third	Total KW	KW per Lb.
63	15.27	14.04	14.75	44.06	.126
70	14.62	17.10	16.98	48.70	.139

Table 7. Comparison of Power Consumption Requirements—GRS X-435 and X-485

Stock	Hydrocarbon	Black	KW-Cycle First	KW-Cycle Second	KW-Cycle Third	Total KW	KW per Lb.
1	X-435, bale	50 HAF	13.39	16.12	9.48	38.99	.114
2	X-485, bale	50 HAF	13.30	15.85	9.31	38.46	.113
3	X-435/GR-S Std., two-pass	25 HAF 15 EPC	32.86	10.67	....	43.53	.109
4	X-485/GR-S Std., two-pass	25 HAF 15 EPC	29.81	12.82	....	42.63	.107

In an attempt to reduce power further the effects of Gordon mastication were investigated. GR-S X-435 was premasticated with both one pass and two passes through the Gordon. Heat hardening and some resinification were encountered, resulting in actual increases in power consumption rather than a saving. However a 50/50 blend of GR-S X-435 and standard GR-S given two passes reduced power consumption appreciably. An interesting comparison was also made between a three-cycle mix using two-pass standard GR-S and a two-cycle mix using three-pass standard GR-S. The overall power cost of the latter, including the cost of plastication, compares favorably with the three-cycle mix with a resultant overall saving in mixing cost. The results of these mixing variables are shown in Table 5.

It was evident at the start of this study that the Mooney value of the polymer must be considered in any comparisons made. Table 6 illustrates the effect on power consumption of GR-S X-435 at two Mooney levels.

GR-S X-435 with ditertiary butyl hydroquinone shortstop and GR-S X-485 with dinitro chlorobenzene shortstop were compared during the course of this work to determine the relative power requirements. There was no basic difference between the two low-temperature polymers when they were compared in two separate black compounds, Table 7.

Finally, a comparison of Stock 1, Table 5, and Stock 1, Table 7, can serve to illustrate what may be accomplished by mixing technique and by changes in plasticizer-black ratios. The power requirements of this compound have been reduced from 56.09 kw. per batch to 38.99, or a saving of 17.1 kw. Based on subsequent tests, this saving has been accomplished without any appreciable change in quality.

Summary and Conclusions

It may be concluded from this work that GR-S X-435 low-temperature polymer requires more power than standard GR-S in the approximate relation to its higher Mooney value and that synthetic-type polymers consume more power on mixing than does natural rubber when used in tire compounds.

Types of black have a pronounced effect on power consumption during mixing, and this effect is not necessarily in the order of their respective particle size.

Mixing technique may be varied to reduce power consumption and to eliminate serious overload peaks which would be detrimental to processing equipment and transformers.

Judicious blending of types of blacks and blends of polymers may be used successfully to reduce power consumption during mixing.

The plastication of GR-S X-435 in a Gordon plasticator does not reduce the power requirements, but blends of GR-S X-435 and standard GR-S in the plasticator do result in softer stocks requiring less power.

The ratio of oil to black has a definite bearing on power requirements, and indications have been found that various types of plasticizers and plasticizer combinations may also influence power requirements to a marked extent.

The authors wish to thank J. Gersbach for his assistance in the accumulation of data and F. Leopold for his valuable criticism and his aid in arranging for the necessary electrical equipment.

Carbon Black Statistics

Following are statistics for the production, shipments, producers' stocks, and exports of carbon black for the fourth quarter and all of 1948. Production, shipments, and inventory figures are compiled from reports made available to the Bureau of Mines by the National Gas Products Association, and by direct reports from producing companies whose operations are not covered by the Association. Export figures are reported by the Department of Commerce, but are not fully comparable in a given month because of the lapse of time between loading at producing plants and clearance for export.

(Thousands of Pounds)

	October	November	December	Yearly Totals 1948	Yearly Totals 1947
Production:					
Contact types	58,754	56,031	59,185	676,397	654,128
Furnace types	50,034	49,884	53,157	620,600	664,346
Totals	108,788	105,915	112,342	1,296,997	1,318,474
Shipments:					
Contact types	53,769	54,659	52,905	657,229	664,178
Furnace types	52,604	50,969	51,823	595,852	658,120
Totals	106,373	105,628	104,728	1,253,081	1,322,298
Producers' Stocks, End of Period:					
Contact types	18,472	19,844	26,124	26,124	6,956
Furnace types	89,947	88,862	90,196	90,196	65,448
Totals	108,419	108,706	116,320	116,320	72,404
Exports, total	26,781	37,306	23,125	321,915	319,076

Source: Bureau of Mines, United States Department of the Interior, Washington, D. C.

The Compounding and Processing of a "Cold Rubber" Tire Tread

H. C. Steffen[1]

THREE times in the past decade the American rubber compounder has been faced with the problem of taming an unruly polymer. The original Buna S on which this country's synthetic program was founded, was entirely too difficult to process in the quantities needed for national defense. It was decided to lower the intrinsic quality of the polymer in the interest of production and to pass on to the compounder the problem of making up that deficiency. The success which followed the acceptance of this challenge needs no emphasis here. Production flowed through the tire factories of this country at a rate previously regarded as impossible. Banbury mixers were speeded up and processing all along the line moved at an accelerated pace and temperature.

With the re-introduction of natural rubber in volume after the war it was ironically described as impossible to process. The industry built on natural rubber found its return to the original polymer to be almost as difficult as has been its introduction to synthetic.

Now "cold rubber" (GR-S polymerized at a temperature of 41° F.) has for the third time brought with it major processing problems. "Cold rubber," while admittedly a stronger[2] and better wearing rubber than GR-S, has generally been found more difficult to process, and the polymer chemist is again under pressure to modify the polymer to make it easier to process even at the risk of degrading it.

The Role of Furnace Carbons

With the development of the synthetic rubber industry in this country came a parallel expansion of the furnace black industry. In 1940 synthetic rubber was only 0.5% of the total rubber used in this country. Furnace carbons represented 13.5% of total carbon black production. In 1948 synthetic rubber was 36% of the total consumed, and furnace carbon constituted 48% of the total, a gain of about 35%.

While this expansion in furnace black production solved the problem of carbon supply, it did bring problems of scorch and cure. It has been pointed out[3] that in the case of *Hevea* and GR-S there was a temptation to solve the problem of cure scorch with furnace carbons by reduction in curative. In the case of GR-S, the advantage of using retarding softeners, with curatives at adequate levels, was pointed out. With *Hevea*, as with GR-S, curative starvation was dangerous. It was shown that VFF carbon (Statex K) neither accelerated nor retarded the vulcanization process. Therefore with VFF carbon it is now possible to regain in *Hevea* tread stocks some of the benefits from the excellent aging, flexing, and resilience properties of pure gum stocks, through the use of lower sulfur (2% to 2.25%) and higher accelerator (0.8 to 1% benzothiazyl-sulfenamide) than had previously been possible with channel black treads. In the case of "cold rubber," there now seems to be a need of differentiating between types of furnace carbons.

Experiments with "cold rubber" on laboratory scale or even pilot-plant scale showed striking advantages for the new polymer in road wear and marked a most encouraging step toward self-sufficiency in rubber for this country. However, when this early work was expanded to full plant scale, both as regards polymer and tire making, it soon seemed that the tire compounder was up against another round of processing difficulties. In many places this condition still exists and has resulted in the use of time and money consuming expedients to maintain Banbury processing temperatures below 300° F. It will be shown that the successful use of "cold rubber" has been impeded by the failure to use a suitable carbon black for its reinforcement.

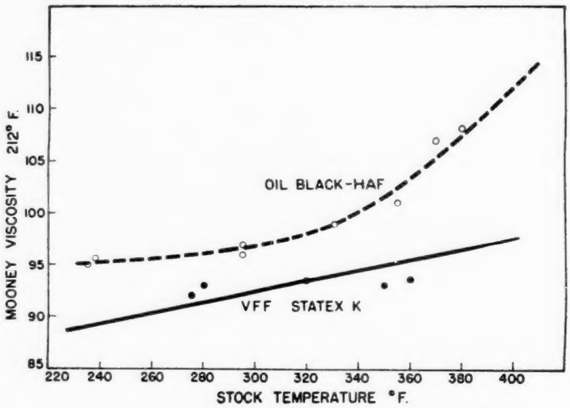

Fig. 1. Mooney Viscosity *vs.* Stock Temperature for 50 PHR Carbon Masterbatch in GR-S X-485

VFF Carbon

The first indication that the "scorchiness" of "cold rubber" was not inherent in the rubber, but attributable to the black used with it, came from a laboratory appraisal of the polymer. Conventional laboratory evaluation, as typified by the Rubber Reserve procedure, calls for mixing on 6- by 12-inch mill rolls kept at 110 to 130° F. Realizing that factory processing temperatures are far in excess of this, preliminary mixes in this laboratory were first made on rolls with 200° F. water circulating, giving stock temperatures of the order of 225-270° F. Since these temperatures were still too low, the laboratory Banbury was used to get higher temperatures. A midget Banbury running at 100 r.p.m. with a six-minute cycle was used. Starting with a simple masterbatch of GR-S X-485, 100 parts, and carbon black, 50 parts, the effect of mixing temperature on Mooney viscosity was determined with results as shown in Figure 1. The viscosity of the VFF (Statex K) master increases slowly and linearly with temperature; while that of the oil black (HAF) is at a higher level and shows an accelerated increase in viscosity beyond 300° F. This condition seems to correlate with early factory experience which indicated scorch trouble at Banbury temperatures above

[1] Field engineer, Columbian Carbon Co., New York, N. Y.
[2] W. F. Tuley, *Rubber Age* (N. Y.), 64, 194 (1948).
[3] Braendle, Steffen, Sheppard, India Rubber World, Oct., 1948, p. 57.

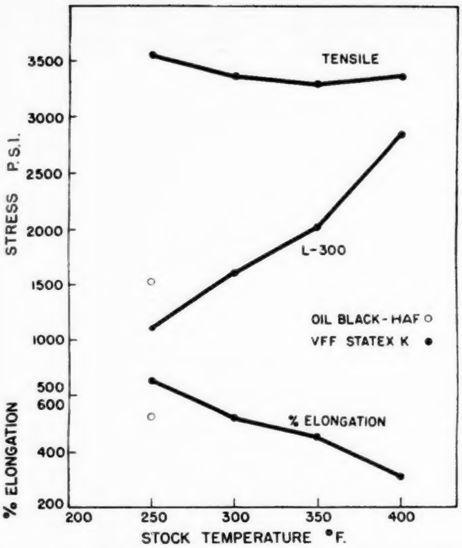

Fig. 2. Stress Properties *vs.* Mixing Temperature—Statex K in Low-Temperature GR-S X-481 (40 Minutes at 292° F.)

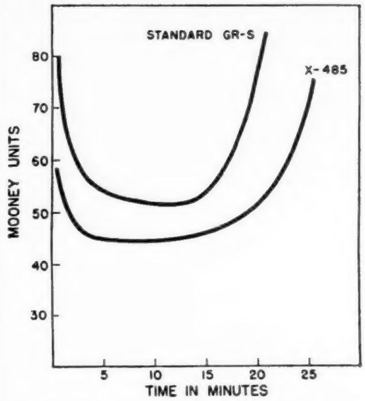

Fig. 3. Mooney Scorch at 280° F. of VFF Carbon 50 Parts in Standard GR-S *vs.* X-485

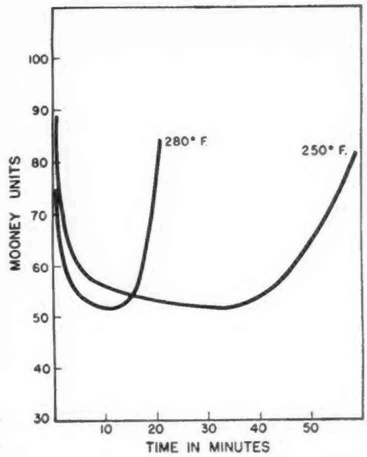

Fig. 4. Effect of Temperature on Mooney Scorch of VFF in Standard GR-S Tread

300° F. A complete tread formula, as below, was used to determine the effect of mixing temperature on physical properties of the cured tread.

VFF = "Cold Rubber" Test Recipe

X485	100
Carbon black	50
Zinc oxide	3.5
Stearic acid	2.0
Paraflux	4
Circosol 2XH	4
Sulfur	2.0
Santocure	1.125

A batch, 12 times the formula weight, was used in a #00 laboratory Banbury. A six-minute cycle on the masterbatch, including the softeners, was used throughout; the temperature was attained by adjustment of rotor and case temperatures. After a rest period the black masters were given a four-minute remill in the Banbury at or near the original temperatures. Following another rest period the batches were "finished" on a laboratory mill with 200° F. water circulating.

Figure 2 illustrates the effect of mixing temperatures on the physical properties of the VFF carbon (Statex K). It is seen that VFF (Statex K) treads can give to "cold rubber" a modulus equal to that obtained with oil black (HAF), and without the penalty of excessive shortness, while at the same time permitting safe processing at a temperature 50° F. or more higher than with the oil black (HAF).

The next step involved factory processing.

Factory Processing

The following formulation was used.

GR-S X-485	100
VFF (Statex K)	50
Zinc oxide	3.5
Stearic acid	2.5
Paraflux	3.0
Circosol 2XH	5.0
Santocure	1.125
Sulfur	2.0

A two-speed (20 and 40 r.p.m.) #11 Banbury was employed for the masterbatch, which included everything except the sulfur and accelerator; the Banbury charge was 392 pounds, 9 ounces. Two procedures were used as listed below; the prime objective was to reach two different temperature levels.

Mixing Stages	Run #1	Run #2
I — 6′ @ 20 r.p.m.	Polymer + ½ carbon + ½ softener	Polymer + all carbon + all softener
II — 4′ @ 40 r.p.m.	Balance of carbon Cooling water on	Straight remill No cooling water
III — 6′ @ 20 r.p.m.	Sulfur and accelerator	Sulfur and accelerator

Stock temperatures attained were:

	Run I	Run II
Banbury stage I	267° F.	270° F.
Banbury stage II	350° F.	375° F.
Banbury stage III	260° F.	260° F.
Ribbon feed mill	212° F.	238° F.
Mooney ML 4 (large rotor-212° F.)	63+	61+
Mooney scorch MS 280° (finished stock)	24′	23′
(After extrusion)	18′	20′

Both stocks looked good on the sheeting mills, and there were no indications of scorch. The high-temperature stock (375° F.) excelled in smoothness and gloss on freshly cut surfaces. Further evidence that there was no scorch is revealed in Figure 3. Here the "cold rubber" tread is compared with a safe processing Standard GR-S compound for Mooney scorch at a testing temperature of 280° F. Since the higher testing temperature employed is almost three times as rapid as the conventional Mooney scorch test at 250° F. (Figure 4), the safety margin required for tread production equals that of Standard GR-S tread stocks.

Properties of Factory Stocks

Physical tests of these factory processed compounds gave the following results at or near factory tire cures.

Table 1. Factory Processed GR-S X-485 Statex K Tread Compounds

	Run 1	Run 2
Stock temperature—Stage II	350° F.	375° F.
Mooney viscosity ML 4′ (large rotor)	63	61
	Green Physical Properties	
Cure @ 292° F.	60′	60′
Modulus L-300, p.s.i.	1560	1650
Tensile, p.s.i.	3650	3650
Elongation %	565	550
Shore hardness, 5″	61	60
Rebound %	56.9	59
	Oxygen Bomb Aged (Four Days 158° F.—300 p.s.i.)	
Cure @ 292° F.	60′	60′
Modulus L-300, p.s.i.	1900	1980
Tensile, p.s.i.	3025	3075
Elongation %	455	460
Shore hardness, 5″	66	65
	Geer Oven Aged (24 Hours @ 212° F.)	
Modulus L-300, p.s.i.	2350	2580
Tensile, p.s.i.	2850	3000
Elongation %	350	340
Shore hardness, 5″	67	67

Run 2, which was processed at the higher temperature, developed higher modulus throughout, but tensiles remained unchanged. It is apparent that modulus of "cold rubber" treads is in considerable measure a function of processing temperatures. With VFF (Statex K) the rubber compounder is able to control modulus development to meet his requirements and at the same time aid resistance to tread chipping and cracking by maintaining ultimate elongations above the danger zone of 500%. In view of present market conditions in the tire field, where warehousing has to be considered, excessive shortening during storage may have disastrous effects. VFF (Statex K) provides the compounder with a fully reinforcing carbon that enables him to take advantage of high-speed and high-temperature conditions encountered with modern high-speed Banbury mixing operations.

Road Tests

Tread stocks listed in Table 1 were built into passenger tires and tested under the following conditions:

Tire size	6.50x15
Inflation pressure	28 p.s.i.
Overload	20%
Speed	60 m.p.h.
Road	All pavement
Location	Southwest Texas

The tires were rotated one position on the car every 1,000 miles. As a control tire, a "cold rubber" tread was employed using identical formulation, as shown, except that a small particle oil carbon (HAF) was used, and softener content was increased 50% in order to maintain equal Mooney values. Tires from Banbury Run 1 (the cooler) wore equal to the control; while tires from Run 2 outwore the control by 5%.

Details of this run are given below:

Miles Run	Miles per Mil Wear	Cracking of Tread
4,300	98	None
8,700	110	None
13,000	119	None
17,400	118	None
21,950	117	None
26,300*	124	None

* 40% of the non-skid remained at this mileage.

Conclusions

(1) From the results reported in this paper the outstanding value of VFF carbon (Statex K) in "cold rubber" is indicated.

(2) "Cold rubber" with VFF carbon appears no more difficult to process than Standard GR-S treads.

(3) Large amounts of softener which tend to depress road wear are unnecessary with VFF carbon.

(4) Costly expedients for cool processing low-temperature GR-S are not required when VFF is employed as the reinforcing carbon.

(5) VFF carbon is at its best in "cold rubber" when processed under high-temperature conditions (about 375° F.), thus permitting high-speed efficient mixing. So processed, the VFF "cold rubber" tire gave 5% better road wear than a tire made from a stock of similar Mooney containing fine particle oil carbon.

Acknowledgment is made to Joseph Rockoff, vice president, Dayton Rubber Co., for courtesies extended during the processing and building of the test tires described, and to W. B. Wiegand, vice president, Columbian Carbon Co., for permission to publish this paper.

Malayan Rubber Statistics

The following statistics for January, 1949, have been received from Singapore by way of Malaya House, 57 Trafalgar Square, London, W.C.2, England.

Ocean Shipments from Singapore and Malayan Union—In Tons

To	Sheet and Crepe			Latex, Concentrated Latex, and Revertex (Dry Rubber Content)			Total All Grades
	Singapore Export Proper	Malayan Union Trans-shipped	Malayan Union Direct Shipments	Singapore Export Proper	Malayan Union Trans-shipped	Malayan Union Direct Shipments	
Argentine Republic	9	29	...	21	...	...	59
Australia	651	171	339	1	8	...	1,170
Austria	...	5	...	...	...	...	5
Belgium	292	357	508	12	52	8	1,229
Bulgaria	342	...	...	...	...	...	342
Burma	...	...	1,412	...	...	...	1,412
Canada	1,717	50	1,802	...	...	...	3,569
Chile	25	...	12	...	...	...	37
China	5	...	...	...	...	...	5
Cyprus	4	...	...	...	...	...	4
Denmark	103	64	185	...	...	...	352
Egypt	20	...	3	1	...	...	24
France	1,312	358	2,724	185	...	101	4,680
Germany	3,239	2,153	2,496	163	158	...	8,209
Hong Kong	509	...	306	...	...	...	815
Italy	1,002	280	1,329	20	222	33	2,886
Japan	1,920	...	1,176	30	103	...	3,229
Mexico	100	...	...	...	...	...	100
Netherlands	790	837	7 871	14	51	52	9,615
Norway	10	119	50	...	10	6	195
Other countries in North America	2	...	...	...	...	...	2
South America	102	...	...	3	...	...	105
Pakistan	2	...	...	...	...	...	2
Philippine Islands	...	...	...	1	...	...	1
Poland	175	...	75	...	...	...	250
Portugal	76	20	32	...	...	...	128
Portuguese E. Africa	...	5	...	...	...	...	5
Rumania	50	125	100	...	...	...	275
Russia	450	284	2,918	...	...	...	3,652
Sweden	95	77	419	7	...	6	604
Switzerland	50	...	...	...	...	...	50
Syria	3	...	...	...	...	...	3
Turkey	85	75	395	...	...	...	555
Union of India	400	...	...	1	...	...	401
South Africa	1,211	503	543	3	8	...	2,268
United Kingdom	5,818	3,675	7,177	1,005	54	229	17,958
U. S. A.	12,026	1,237	14,348	1,058	2	746	29,417
TOTAL	32,595	10,424	46,220	2,525	668	1,181	93,613

Foreign Imports of Rubber in Long Tons

Singapore Imports from	Dry Rubber	Wet Rubber (Dry Weight)
Banka and Billiton	368	50
Brunei	145	1
Dutch Borneo	740	756
French Indo-China	996	...
Java	174	...
North Borneo	1,307	50
Other countries in Asia	20	3
Other Dutch Islands	69	4
Rhio Residency	714	44
Sarawak	3,357	45
Sumatra	1,291	4,396
TOTAL	9,181	5,349

Federation of Malaya Imports from		
Burma	800	38
Siam	2,567	...
Sumatra	1,221	514
TOTAL	4,588	552

Dealers' Stocks

	Tons
Penang and Province Wellesley	12,714
Singapore	42,799
TOTAL	55,513

Port Stocks in Private Lighters and Railway Godowns

Penang and Province Wellesley	4,939
Port Swettenham	1,445
Singapore	13,867
Teluk Anson	447
TOTAL	20,698

Production

Estates	36,397
Small holdings (estimated)	22,240
TOTAL	58,637

Permanent Set in Vulcanized Rubber[1]

L. Mullins[2]

THE residual extension which remains after a sample of rubber has been stretched for some period, then released and allowed to recover, is popularly called "permanent set." This set, however, is far from being permanent as it continuously decreases with the period of recovery; and further, after the rate of recovery has become exceedingly slow, and therefore is no longer readily observable, an increase in temperature will usually result in a sharp increase in the rate of recovery. It has been usual to identify this set with irreversible plastic flow, but it will be immediately apparent that this can rarely be justified, as owing to incomplete high-elastic recovery the measured value of set is a combination of both plastic flow and high-elastic deformation which has not completely recovered. Thus before any attempt is made to discuss the interpretation of the results of set tests a study must be made of the significance of set.

Treloar[3] has investigated this phenomenon in raw natural rubber and has shown that entanglements or cohesional linkages may form while the rubber is stretched, and these oppose recovery; further, although Van der Waals forces between the long-chain molecules largely control the rate and the amount of recovery, the crystallization of rubber produced by stretching may profoundly influence the set. On the other hand Tobolsky[4] has studied the set which results from stretching rubber vulcanizates at high temperatures; in such cases the amount of set is controlled by two processes which take place while the rubber is stretched; one of these involves the oxidative breaking of network chains, and the other the oxidative cross-linking of network chains.

Although these ideas are well founded, they do not provide a completely satisfactory basis for the understanding of set, and the purpose of this work is to extend these ideas and to explain the significance of the results of normal set tests; in these tests rubber samples are extended at room temperatures to moderate elongations for relatively short periods of time. Most of the tests performed in this investigation were made on dumbbell shaped samples, which were extended by 200% of their initial length for 15 minutes at room temperature and then allowed to recover for one hour at room temperature; the residual extension was then noted and expressed as a percentage of the initial length. These tests will be referred to as normal set tests. In some tests various periods and temperatures of extension and recovery were used.

Effects of Fillers on Set

Normal set tests were made on a series of natural rubber vulcanizates including a "pure gum" vulcanizate and others with similar volume loadings of a variety of fillers (approximately 20% by volume). The compounding details are given in Table 1; all mixes were cured to the optimum indicated by tensile tests. With the pure vulcanizate the set was extremely small, but with the loaded vulcanizates much larger values of set were recorded. Figure 1a shows the results of repeated normal set tests performed on samples from each mix; here, after the one hour's recovery of the previous test the samples were

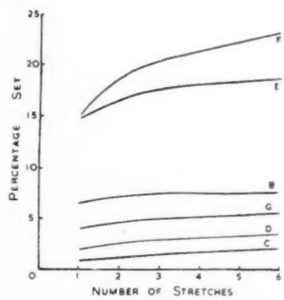

Fig. 1a. Effect of Repeated Stretching on Set

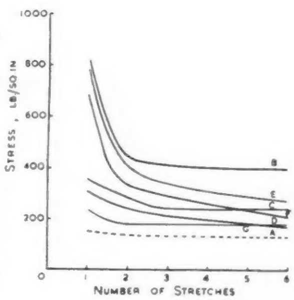

Fig. 1b. Effect of Repeated Stretching on Stiffness

TABLE 1. COMPOSITION OF MIXINGS

Base Mixing	(Parts by Weight)
Smoked sheet	300
Zinc oxide	5
Stearic acid	2
Sulfur	3
Mercaptobenzothiazole	0.8

Additional ingredients were as follows:

Mix A	None
Mix B	MPC black 50; pine tar 4.5
Mix C	FT black 50
Mix D	Activated whiting 75
Mix E	Colloidal China clay 75
Mix F	Magnesium carbonate 60
Mix G	Barytes 335

Vulcanized for 30 minutes at 153° C.

measured and extended again to the same final length. The figure does not show the results for the pure vulcanizate which were always very small ($<\frac{1}{2}\%$). In all cases the results clearly show that after the first stretch the contribution of subsequent stretches to the set gets progressively smaller. Measurements were made also of the stress required to extend samples to the chosen elongation; the results are shown in Figure 1b. Here the stress required to extend the samples gets progressively smaller as the number of stretches increases. Comparison of the two sets of results shows that stretching results in little increase in the set when it does not also lead to softening. This phenomenon of softening which results from previous stretching has been discussed in an earlier work[5] and is attributed to a change in the disposition of the filler particles produced by stretching.

The results demonstrate also the differences which occur when changes are made in the type of filler; two important features are (1) those fillers which are known to give anisotropic properties show greater set, and (2) the stiffness of the rubber is not a useful indication of the set to be expected when vulcanizates containing different types of fillers are compared. These features, which are shown clearly by the data in Table 2, will be referred to later in this paper.

TABLE 2. STIFFNESS AND SET AT 20° C.

Filler	None	MPC Black	Activated Whiting	Colloidal China Clay	Magnesium Carbonate	Barytes	FT Black
Stress 300% (lb./sq. in.)	200	1,580	420	870*	730*	335	600
Set (200%) %	<0.5	7.5	2	13*	14*	4	1

*Measured along grain.

Effect of Temperature of Recovery on Set

It is well known that samples retract continuously after

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[1] Presented before the 1948 Rubber Technology Conference, London, England, June 24, 1948.
[2] Research Association of British Rubber Manufacturers, Croydon, England.
[3] *Trans. Faraday Soc.*, 36, 538 (1940).
[4] R. D. Andrews, A. V. Tobolsky, E. E. Hanson, *J. Applied Phys.*, 17, 352 (1946).
[5] L. Mullins, *J. Rubber Research*, 16, 275 (1947).

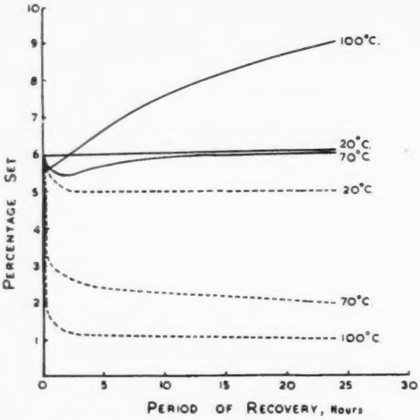


Fig. 2. Recovery at Various Temperatures

release, and that an increase in the temperature of recovery leads to an increase in both the rate and extent of recovery. Samples which had been extended for 15 minutes at room temperatures were allowed to recover at various elevated temperatures ranging from 20 to 120° C.; at the highest temperatures the recovery was rapid and almost complete, showing that the amount of plastic flow or truly irreversible processes occurring during extension was very small.

The broken lines in Figure 2 show the recovery with time of the MPC black vulcanizate at 20, 70, and 100° C.; these curves show the continuous recovery with time and the increased rates which occur at higher temperatures. The full lines in this figure show the set present after a further normal set test had been performed on samples which had been allowed to recover for various periods. It will be remembered that if there had been no recovery, this additional set test would have resulted in but little increase in set (see Figure 1); thus the increase produced by this test is associated with the recovery of the material toward its inital state.

It will be observed that after a few hours' recovery at 100° C. the set actually exceeds the value recorded for the first stretch. This condition is attributed to the exposure at high temperatures resulting in a greater degree of filler structure than was present in the original material. To confirm this, samples were heated to 100° C. for 24 hours before any testing; subsequent normal tests showed that the set resulting from a single test had increased from 6.0% to 8.5%, and the stress required to stretch the rubber to 200% elongation had increased from 830 lbs. sq. in. to 1,100 lbs. sq. in. On the other hand, pure vulcanizates showed no significant change of properties resulting from this heat treatment.

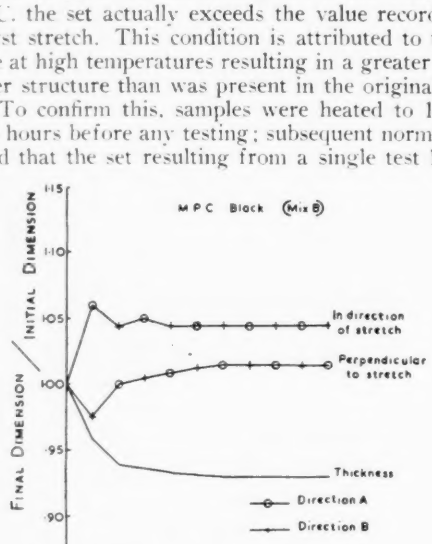


Fig. 3a. Effect of Repeated Stretching in Perpendicular Directions

Anisotropy Produced by Stretching

Pronounced differences exist between the physical properties of vulcanizates, containing fillers which stiffen the rubber, before and after stretching. Stretching destroys much of the increase of stiffness produced by the filler; the softening is greatest in the direction of stretch. It seemed possible that these anisotropic properties of loaded vulcanizates, which are produced by stretching, may also be associated with set; to investigate this possibility repeated set tests were performed alternately in two perpendicular directions on sheets of rubber six inches square and 1/10-inch thick. The sheet was clamped along two opposite sides and extended so that the side of a one-inch square marked on the center of the sheet was extended 150% (direction A); the sides were then held extended for 15 minutes and allowed to recover for 30 minutes. The sides of the square and the thickness of the

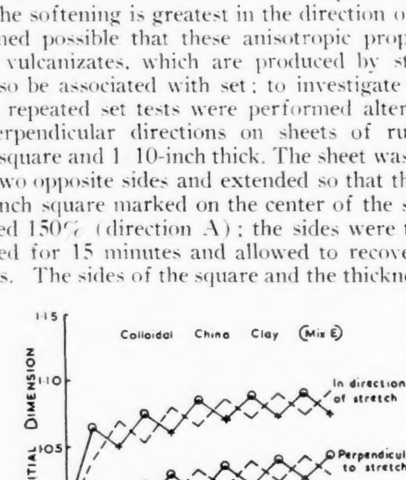


Fig. 3b. Effect of Repeated Stretching in Perpendicular Directions

sheet within the square were then measured and expressed as a percentage of their value before any stretching. The next test was performed with stretch in the perpendicular direction (direction B). The result on two of the mixings are shown in Figures 3a and 3b.

First, consider the results obtained on the MPC black vulcanizate. The set remaining after the initial stretch is accompanied by a reduction in the dimensions of the two perpendicular directions; the volume remains constant; the reduction in the direction in the plane of the sheet (direction B) is somewhat less than the reduction in the thickness, owing to constraints of the clamps causing less straining in direction B.

In the figures measurements made in the direction of the initial stretch (direction A) are marked by circles; while measurements in the perpendicular direction (direction B) are marked by crosses.

The second stretch, in the perpendicular direction (direction B), shows less set, owing to incomplete recovery after the first stretch. After several stretches these differences disappear as there is then similar incomplete recovery of the previous stretches before every stretch. The results in Figure 3b were obtained on the colloidal China clay vulcanizate; besides showing behavior basical-

ly similar to that already discussed, they show also an interesting effect resulting from the presence of grain; the set in the direction of the grain is always greater than the set in the direction across the grain. In this figure the full and the broken lines represent cases where the initial stretch was made along and across the grain respectively.

These results show that part of the filler structure associated with set can be oriented repeatedly from one direction to another; this reversal is shown clearly by the curves, after four or five stretches, in Figure 3a; they show also that any anisotropy of filler structure or grain, present before the commencement of the tests, is not destroyed by stretching to these elongations, i.e., the differences between the set along and across the grain do not decrease. It appears that in loaded vulcanizates, which show true grain effects, the set can be considered to have two components, one due to the orientation by stretching of initially randomly disposed filler particles or chains of filler particles, and the other due to grain or the preferential and apparently permanent orientation of the filler in one direction.

Discussion

The results of these tests can be understood on the assumption that the most important single factor responsible for set, in normal set tests on loaded vulcanizates, is an anisotropy of disposition of the filler which results from stretching. "Pure" vulcanizates stretched to moderate elongations show very little set, and the difference between the set of a loaded and a pure vulcanizate is attributed to the orientation of anisotropic filler particles or of chains of filler particles in the direction of stretch. On release these particles are partially reoriented by thermal forces which tend to draw the rubber back to its original shape; this recovery of the rubber takes place in the face of energy barriers or weak bonds which can readily be ruptured by the thermal forces resulting from increases in temperature. Thus the amount of set after a chosen period of recovery is dictated by both the increased rate of recovery which occurs at higher temperatures, and the final equilibrium between these intermolecular bonds opposing recovery and the thermal forces leading to recovery. If large elongations are used, then crystallization may affect the set.

Of course, if extensions are carried out for long periods, or if they take place at high temperatures, then much of the set may be due to chemical processes which modify the rubber network. In such cases strong intermolecular bonds which cannot be readily ruptured by heating to higher temperatures are formed. Table 3 gives the set remaining after 24 hours' recovery at 120° C. of samples of both the pure and the MPC black vulcanizates, which had been extended to 200% elongation for various periods at room temperature.

TABLE 3. PERCENTAGE SET AFTER 24 HOURS' RECOVERY AT 120° C.

Period of extension at 20° C.	Hours ¼	One	Four	24	Days Seven
"Pure" vulcanizate.	0	0	0	0.5	1.0
MPC black vulcanizate	1.0	1.0	1.25	1.75	4.5

These figures demonstrate a progressive increase in the irreversible component of set with period of extension. Examination of recovery time curves, obtained on similar samples extended for various periods and allowed to recover at room temperature, showed that although increased periods of extension caused greater set, they only slightly affected the rate of recovery expressed as a fraction of the set, and also the rate of recovery of the "pure" vulcanizate was much more rapid than that of the loaded vulcanizate.

Extension at high temperatures gave very large values of set, and a considerable amount did not recover after prolonged recovery at 120° C. In this investigation, however, we are restricting ourselves to a study of the set present after normal set tests, and it has been shown that processes of this type have little effect.

A possible contributing factor to the set of loaded vulcanizates, which was investigated, is that the volume of the compounded rubber may increase on stretching owing to the formation of vacuoles around the filler particles. Measurements of the change of volume produced by stretching to 200% elongation made on all the vulcanizates, except the one including barytes, showed that in no case was the increase in volume greater than 0.1%. Thus in these cases this factor was negligible.

Carbon black is by far the most important filler in the rubber industry, and a large range of grades is available for use as fillers; of these blacks, those with the smaller particle sizes stiffen the rubber more than those with the larger particle sizes, and electron microscope studies of vulcanizates loaded with black show the presence of coherent contacting chains of spherical carbon particles; the chains are more prominent the smaller the particle size of the black; while electrical measurements also show that chains must exist. On stretching, the increased stiffness produced by the incorporation of black is largely destroyed in the direction of stretch; and thus, other things being equal, the degree of anisotropy present after stretching will be greater in samples containing the smaller particle-size blacks which cause larger initial increases in stiffness. Table 4 gives measurements of the stress required to extend dumbbell shaped samples of vulcanizates containing similar volume loadings (approximately 20% by volume) of a variety of blacks together with the set remaining after normal set tests.

TABLE 4. STIFFNESS AND SET OF BLACK VULCANIZATES.

Type of Black	HMF	MPC	EPC	SRF	Lamp-black	MT	ET
Stress (300%) lbs./1 sq. in.	2,200	1,580	1,550	1,420	1,380	750	600
Set (200%) %	7.5	7.5	7.0	4.0	4.0	2.5	1

The results show that those blacks which give the larger stiffness also result in greater set and therefore are in full agreement with the idea that the set is due to the orientation of anisotropic chains of carbon particles. Trends of this type have led to the use of empirical relations connecting stiffness or hardness with set, but close relations are not to be expected as the amount of set results from the interplay of a number of factors which influence the energy barriers which have to be overcome during recovery; for example, different blacks or different fillers will have different chemical natures which may in turn modify the formation of chains or intermolecular bonds. The differences which occur when changes are made in the type of filler are amply demonstrated by the results shown in Figure 1. One interesting feature of these results is that fillers known to possess anisotropic properties show large amounts of set; while fillers with spherical particles, which do not readily form chains, show little set; the degree of anisotropy of the filler particles, or chains of filler particles, is thus of considerable importance.

One important aspect of rubber compounding is the use of diluent materials to aid processing, to reduce the rubber content, or to soften the finished product. Materials included in this class may be complex mixtures ranging from thin liquids to pitch-like solids and may considerably affect the hardness, stiffness, and set of the vulcanized rubber. A survey of the results of tests done on a very wide range of materials shows that materials

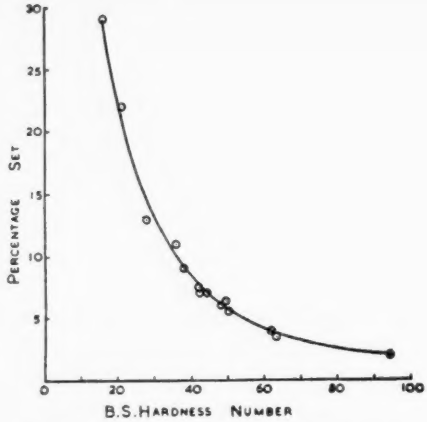


Fig. 4. Effect of Extenders on Set and Hardness

which harden and stiffen the rubber normally cause increased set; while materials which soften the rubber normally cause a reduction in set. This conclusion appears at the first sight to be analogous to the one just discussed where an increase in stiffness produced by the filler was associated with increased set; however, the causes appear to be quite different.

The presence of set after normal set tests is attributed to the slow rate of reorientation of anisotropic filler particles or chains and thus depend upon both the degree of anisotropy and how quickly the individual elements can swing from biased to less biased positions. This rate is obviously controlled by the internal mobility, and the presence of diluent materials which modify this mobility will affect the set. Increased internal mobility, besides producing more rapid recovery and less set, will also result in a decrease in stiffness. Figure 4 shows the results of set and hardness tests of a control tire tread-type mix diluted with a large variety of bituminous extenders; these results are adequately explained by this hypothesis, although it should be noted that the mobility which controls recovery is that existing after, and not before, stretching. Vulcanizates containing pitch-like extenders which give high set and hardness at normal temperatures show very much reduced set at elevated temperatures where the viscosity of the material is greatly reduced.

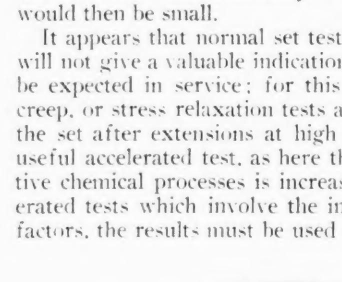
Meaning of Results of Set Tests

Probably the most popular use to which set tests have been put is a means of judging the state of vulcanization of rubber, a large amount of set is regarded as indicating plastic flow and undervulcanization, and a decrease in set with the suppression of plastic flow due to cross-linking. Milled unvulcanized rubber is a mass of unconnected rubber chains and would not recover after stretching but for the fact that entanglements or intermolecular forces make the slippage of the chain molecules past each other slow and provide constraints which enable recovery to take place; the introduction of cross-links stops this slippage. This simple picture has resulted in considerable confusion in interpreting results of set tests, and, more recently, the most important use of set tests has been in judging the snappiness, or the flow properties, of rubber vulcanizates.

It is often observed with loaded vulcanizates that although the set decreases rapidly during the early stages of vulcanization, it may pass through a minimum and thereafter increase instead of getting progressively smaller, or remaining very small; this minimum often occurs after short periods of vulcanization before other tensile properties have reached their optimum value. The evidence which has been put forward here suggests that such minima are associated with a continuous aggregation of filler particles which occurs readily at the high temperatures used for vulcanization. This aggregation, besides producing increased stiffness, conductivity, and power factor, also leads to an anisotropy of the filler when its chains are oriented by stretching. The measured value of set is then a superposition of two components, one due to plastic flow, and the other due to orientation of filler chains. The first component decreases with increased periods of vulcanization; while the second increases. Thus normal set tests will often not be of assistance in assessing vulcanization when loaded vulcanizates are employed. However, if the test samples were allowed to recover at elevated temperatures, the reorientation of the filler would be assisted, and the residual set would then measure plastic flow and therefore vulcanization; unfortunately the set to be measured would then be small.

It appears that normal set tests on loaded vulcanizates will not give a valuable indication of the flow behavior to be expected in service; for this purpose long-term set, creep, or stress relaxation tests are necessary. However the set after extensions at high temperatures may be a useful accelerated test, as here the rate of the deteriorative chemical processes is increased, but, as in all accelerated tests which involve the interplay of a number of factors, the results must be used with caution.

Leakproof Valve



Cut-Away Section of Fulton Sylphon Valve Shows Leakproof Bellows

A NEW type of packless valve claimed far to surpass the service limitations of conventional valves in pressure, vacuum, and temperature conditions, which eliminates the costly maintenance required with stuffing boxes and other means of preventing leakage, has been announced by Fulton Sylphon Division, Robertshaw - Fulton Controls Co., Knoxville, Tenn. The new valve, termed the "No. 300 series," owes its leakproof performance and freedom from maintenance to the seamless metal Sylphon bellows which forms a leakless connection between the valve disk and body. This construction permits repeated opening and closing of the valve, and no maintenance is required to keep the stem absolutely tight against leakage even under extreme pressure or vacuum conditions.

The valves are available equipped with stainless steel bellows and bodies for unusual service conditions. The valve bodies are also available in bronze, cast iron, cast steel, or Monel metal. The bellows is available in Monel metal, phosphor bronze, brass, and a variety of other metals in addition to stainless steel. For high vacuum service a composition disk can be furnished in place of the metal disk. In the screwed-end type the valves are applicable to temperature services up to 300° F., and a yoke and external thread construction can be used for temperatures from 300 to 700° F. The valves are made in sizes ranging from one quarter to three inches, with screwed, welded, or flanged ends.

Photo-Elastic Applications in Rubber Technology—II[1]

James A. Hurry[2]
and Douglas Chalmers[2]

WE WILL frequently refer to "fringe value." This term might be broadly considered an index of modulus. In photo-elastic work it is conventionally expressed in pressure units for shear per unit thickness per band, (photo-elastic line, or fringe). It is, for example, the pounds per square inch (p.s.i.) per inch thickness necessary to produce two successive repetitions of a photo-elastic light band.

Qualitative Applications—Materials and Methods

Fringe Value, Definition and Units

In classical photo-elastic work this definition has made possible one value, "f," for each material at a given temperature. In the extension of this technique to rubber-like materials the non-linear condition again makes necessary modification of classical definition.

We must modify the term "fringe value" in this work to p.s.i. shear per one-inch thickness per whatever particular fringe order or band is associated with the subject load. When "fringe value" is used in this sense, we will identify the fringe order involved; otherwise the classical definition will hold.

We will discuss later the relation of "material" *vs.* "model" fringe value and the conversion of "fringe value" in shear to that in tension.

Selecting Suitable Low-Modulus Photo-Elastic Material

Most of the work which has been done in the science of photo-elasticity has employed Bakelite and celluloid. Some work has also been done with gelatin. It has been used, for example, to study stresses imposed upon underground structures by soil. Bentonite clay suspended in water has been used in flow study by W. Leaf[3] and others. We have also utilized gelatin as a medium in a study of flow through different types of sprues. Because large strains usually must be imposed upon the model, we have not found Bakelite and celluloid to be suitable when a stress condition is being simulated on a rubber product. Naturally, where information is desired on stresses set up in molds or rubber manufacturing machinery, Bakelite and celluloid play the same role as in the general analysis of rigid bodies by photo-elastic methods.

The modulus of Bakelite, and its "fringe value," may be reduced by raising the temperature. This would give it some potentiality as a model material for rubber products. The technique, however, is complicated because it is then necessary to maintain a constant model temperature (about 230° F.). Problems of heat control are injected into the work. Constant temperature must be maintained during the time the model is loaded and measurements and photographs are taken. It is a difficult technique, although not an impossible one. Frocht[4] reports these typical figures for the material "fringe value" "f" of BT-61-893 Bakelite:

	70° F.	230° F.
"f" (p.s.i. shear stress for one-inch thickness per band)	43	1.6

The above values mean simply that at 230° F. only about 1/27 the amount of stress is necessary to produce two successive photo-elastic lines than is required at 70° F.

We have successfully employed substantially pure crepe rubber gum compounds as are formulated below. Their "fringe values" are approximately 1.7 p.s.i., tension for one-inch thickness at approximately 75° F. Expressed in terms comparable to the data of Frocht above, this value would be 1.7 divided by 2, or 0.85 p.s.i. shear per one-inch thickness. The modulus values at 100% elongation are approximately 100 p.s.i. We are indebted to F. M. Torrence, of du Pont, for the excellent photo-elastic gum compound *B* below, although this work has been on *A*.

	A	*B*
Pale crepe	100	100
Sulfur	1.5	1.5
Zinc oxide	.75	.5
Stearic acid	.5	
Tuads (Ethyl)	.25	
Thionex		.19
Acrin		.5

Geon 1437 has been found of considerable usefulness in this technique although subject to some creep and relaxation. We will later discuss the effect of these phenomena. The "fringe value" in tension varies from 2.06 to 8.9 p.s.i. for one-inch thickness for fringe orders 1 and 6 respectively. Again, comparing this to Frocht's data above, this range in shear stress would be in the order of 1.0 to 4.5 for fringe orders 1 and 6. The modulus of the Geon 1437 used was approximately 800 p.s.i. at 50% strain.

Gelatin solutions provide a still lower "fringe value." Frocht[5] reports 0.0725 p.s.i. shear stress for one-inch thickness at 70° F. for aqueous solutions indicated to be in the order of 13%.

TABLE 1. TYPICAL MATERIAL "FRINGE VALUES" "F"

(P. S. I. Shear Stress per One-Inch Thickness per Fringe Order)
Temperature range: 70-75° F.

Material	Approximate Plastic-Elastic State	Typical Stress Strain	"f"
Bakelite BT-61-893 (Frocht)	Rigid plastic Proportional stress/strain	No actual data reported	43
Geon 1437	Thermoplastic	800 p.s.i. 50%	4.5 fringe order 6 1.0 fringe order 1
Pure crepe rubber gum	Highly rubber-like	100 p.s.i. 100%	0.86 (roughly constant over 5 fringe orders)
Gelatin solution 13% approximate (Frocht)	Viscous fluid	No actual data reported	.0725

[1] Presented before the Division of Rubber Chemistry, A. C. S., Los Angeles, Calif., July 22, 1948.
[2] Gates Rubber Co., Denver, Colo.
[3] "Fluid Flow Studies of Locomotive Firebox Design." *Proc. Soc. Experimental Stress Anal.*, 1, 1, 116 (1943).
[4] "Photoelasticity." Max Mark Procht, Vol. I, p. 332. John Wiley & Sons, New York (1941).

Other recommended bibliography includes:

"Handbook of Engineering Fundamentals." Ovid W. Eshbach. Wiley & Sons (1936).
"Stretch Orientation of Polystyrene and Its Interesting Results." James Bailey, India RUBBER WORLD, 118, 2, 225 (1948).
"Study of Tentative A.S.T.M. Stiffness Test as Applied to Rubber." Dietrich G. Stechert. In publication by A.S.T.M.
"The Photo-Elastic Properties of Rubber" and "Stresses and Birefringence in Rubber Subjected to General Homogeneous Strain." L. R. G. Treloar. Publications Nos. 89 and 98, respectively, of The British Rubber Producers Research Association, Welwyn Garden City, Herts, England.

[5] *Opus cit.*, p. 345.

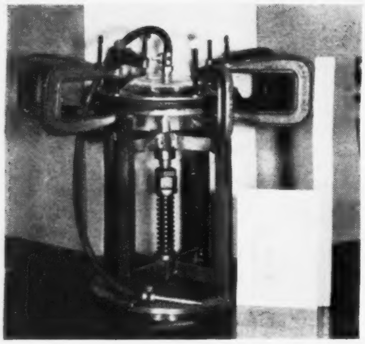


Fig. 4. Diaphragm Loading Jig

Fig. 5. Sprue Design Jig

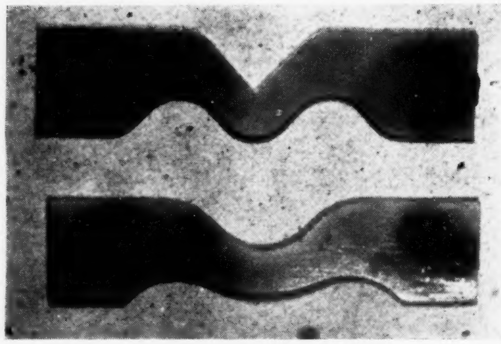


Fig. 8. Tear Test Specimens—Modified Graves *(Top)*; Winkelmann "B" *(Bottom)*

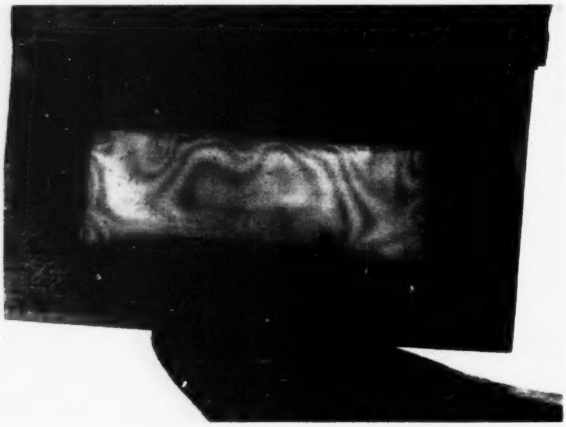


Fig. 6. Sprue Design Jig—Geon Sample

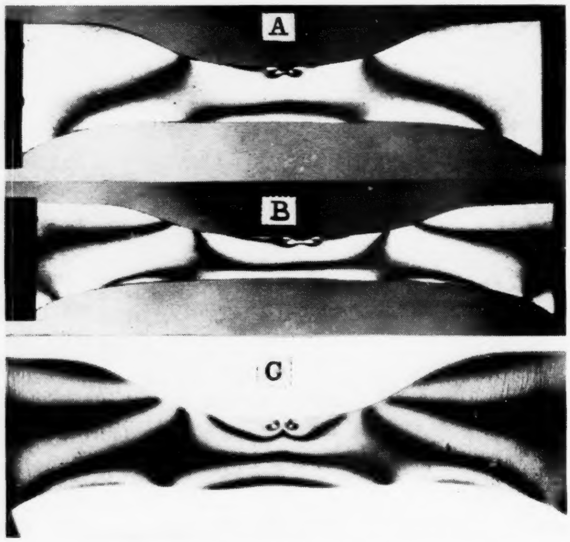


Fig. 9. Winkelmann "B" Tear Model: A, Light Load; B, Moderate Load; C, Severe Load

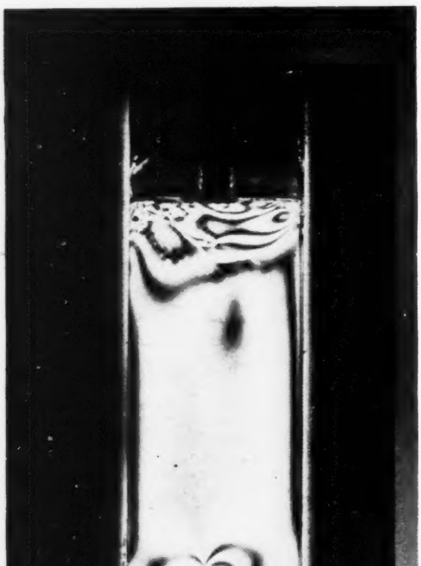


Fig. 7. Lucite Cell with Gelatin

In Table 1 we have summarized data discussed so far. This more clearly shows the relation of "fringe value" with the plastic-elastic state.

Simple Applications of Photo-Elastic Analysis

A qualitative interpretation of the photo-elastic effect in a model can be obtained by simply noting the concentration of the principal stresses, from a general examination of the lines, their origin, and contouring.

MILKING MACHINE INFLATIONS. A flex cracking problem was being encountered in a certain milking machine inflation design. Stresses in this particular design were studied by molding inflations from the clear pale crepe gum compound. Sections were cut and stressed. Isochromatic lines were produced in the sections, using the standard polariscope and quarter-wave plates and white light. Weaknesses in the sectional design were revealed by this study. Since the inflation mold was the property of the customer, no design changes were possible. This study, however, made possible the only alternate solution to the problem—that of adjustment in the modulus of the stock. Field testing and accelerated product testing of the recompounded inflations confirmed the findings of this analysis, and the service problem was substantially eliminated.

PRESSURE CONTROL DIAPHRAGMS. Rubber diaphragms, as employed in some pressure control instruments, have been studied by molding them in the regular

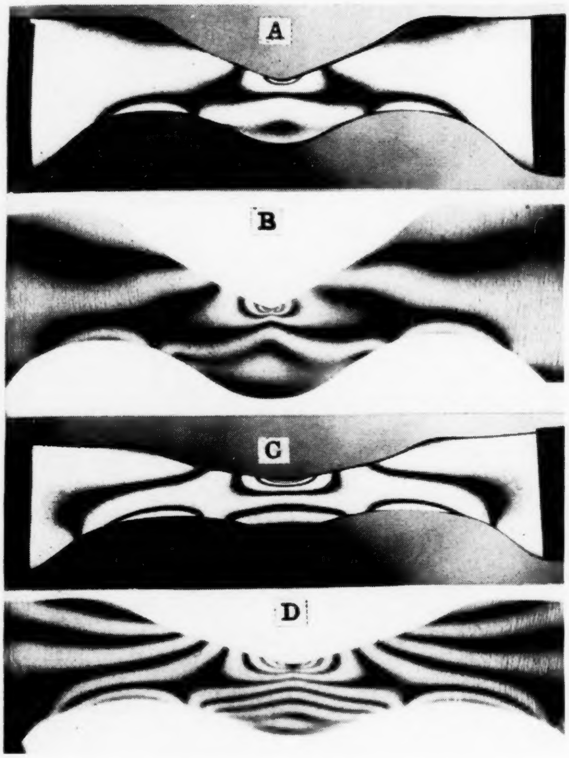


Fig. 10. Graves Tear Model: A, Very Light Load; B, Light Load; C, Moderate Load; D, Severe Load

rubber product mold from clear pale crepe gum compound and from Geon. Model diaphragms have been made with and without fabric. In obtaining satisfactory diaphragms with fabric, some difficulty was experienced in keeping the fabric from "floating," or from being displaced as a result of flow of the compound during molding.

The apparatus set up as employed is shown in Figure 4. A transparent rigid plastic top with a pressure connection enables observing the photo-elastic diaphragm's behavior. The apparatus could be placed into the polariscope, and any desired diaphragm displacement could be obtained and maintained. Four or five fringe orders were observed in the region of high stress, suggesting improvements in design with respect to reinforcing ribs and location of fabric reinforcement.

It should be noted, however, that diaphragms must articulate with spring constants specified by the customer. Design changes, therefore, must satisfy not only redistribution of stresses, but also mechanical compatibility with springs used.

Mold Sprue Design. Because of a molding problem it was desired to study the flow of stock through the sprue of the mold. One useful picture of the problem was made by using clear pale crepe gum compound and Geon in loading frames. (See Figures 5 and 6.) Another aspect of this same problem was the behavior of plastic material around the sprue itself. This was obtained by forcing a 13% aqueous solution of a good grade of gelatin through an orifice in a lucite cell and piston. (See Figure 7.) It can be visualized that by modifications in this technique there can be studied processing problems in the rubber industry related to molding, extrusion, and forming.

Tear Testing Specimens. In the field of rubber test specimen design the photo-elastic method was successfully used in studying stress relations in the Winkelmann "B" tear specimen. These stress relations were compared with a Gates modification of the Graves tear specimen. (See Figures 8, 9, and 10).

In tear testing technique, using material of high distensibility, one of the main difficulties lies in concentrating shear stress in the region of tear. Another difficulty is the inability to obtain uniform nicking.

The Winkelmann "B" tear specimen is a nicked or cut specimen. (See Figure 9.) The Graves tear specimen is unnicked. The Gates modification of the Graves tear has a rounded contour opposite the region of high shear. (See Figures 8 and 10.)

Using the same stock, the ratio of tear values, Winkelmann to Graves, is approximately two to one, depending upon gage values and stock employed. Photo-elastic analysis of this testing problem shows that a high stress concentration occurs at the right angle in the Graves tear specimen. In the Winkelmann "B" the stress was not highly concentrated at the nick. This condition gave evidence that in the Winkelmann tear the stress was largely tensional. This point furnishes an explanation for the two to one ratio of tear value. *(To be concluded)*

United States Rubber Statistics — December and Yearly Totals, 1948

(All Figures in Long Tons, Dry Weight)

	December, 1948						Yearly Totals, 1948					
	New Supply			Distribution		Month End Stocks	New Supply			Distribution		Year-End Stocks
	Production	Imports	Total	Consumption	Exports		Production	Imports	Total	Consumption	Exports	
Natural rubber, total	0	83,420	83,420	43,557	569	130,306	0	702,597	702,597	§598,843	6,673	130,306
Latex, total	0	4,214	4,214	2,428	0	9,651	0	32,630	32,630	§28,489	0	9,651
Rubber and latex, total	0	87,634	87,634	45,985	569	141,541	0	735,227	735,227	627,332	6,673	141,541
Synthetic rubber, total	* 40,454 † 1,679	1,450	43,583	35,446	475	115,133	* 470,706 † 17,637	15,671	504,014	442,072	4,874	115,133
GR-S	* 32,093 † 296	1,182	33,571	27,392	27	‡96,304	* 390,240 †3,640	11,612	§405,492	§345,313	1,093	‡96,304
Butyl	* 5,810	268	6,078	4,515	1	10,995	* 52,603	1,059	56,662	58,870	21	10,995
Neoprene	* 2,551 † 425	0	2,976	3,090	286	5,072	* 27,863 † 6,985	0	34,848	§32,118	2,875	5,072
Nitrile	† 958	0	958	449	161	2,762	† 7,012	0	7,012	§5,771	885	2,762
Natural rubber and latex, and synthetic rubber, total	42,133	89,084	131,217	81,431	1,044	256,674	488,343	750,898	1,239,241	1,069,404	11,547	256,674
Reclaimed rubber, total	21,430	0	21,430	21,377	1,375	32,630	266,861	0	266,861	261,113	11,428	32,630
Grand Totals	63,561	89,084	152,647	102,808	2,419	289,304	755,204	750,898	1,506,102	1,330,517	22,975	289,304

*Government plant production.
†Private plant production.
‡Includes 22 tons shipped for export but not cleared.
§Includes year-end adjustment to account for results given in "Annual Industry Report."
Source: Rubber Division, ODC, United States Department of Commerce, Washington, D. C.

Advances in Rubber, 1947-1948—IV[1]

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THE following is the fourth and concluding installment of the paper covering advances in rubber, October, 1947-June, 1948, as presented at the recent annual meeting of the A.S.M.E. This article began with our January issue.

Applications

A series of articles has surveyed manufacturers' experience in the use of synthetic rubbers and the economic possibilities of these materials (237);[3] while another study deals with the selection of rubbers for different industrial uses (238). Safety features on a new 50-passenger compartment coach include crashproof gasoline tanks adapted from the self-sealing fuel cell used in combat planes, and wire cord tires (239). The major development in tire design has been centered on extra-low-pressure tires utilizing wide-base rims (240-244). In the discussion of fundamental principles of tire design, consideration has been given to the tire as an air-container, as part of the transmission system, and as part of the suspension system (245). Factors which affect the power consumption of pneumatic tires have continued to receive attention (246), and special consideration has been given to farm tractor tires, particularly in relation to wide- *vs.* narrow-base rims and the effect of liquid ballast on tire performance (247). A description has been given of two Swiss passenger-train coaches with rubber tires which are said to give greater riding comfort, reduced wear, and improved braking power (248).

A rubber heating pad bonded to the inside surface of the jet cowl in an experimental plane has suggested possibilities of heated rubber as protection against icing (249). Pliotherm heating units, covered with rubber or plastics in a range of colors, are electrical resisters that develop heat upon application of current and are said to offer a simple means of heating homes (250). Data have also been made available on Uskon radiant heating panels which generate heat from a conductive-rubber resistance element sandwiched between several layers of phenolic laminates (251).

A report has been made of an analytical study of all available experimental data relating to human tolerance of vertical sinusoidal vibration with the objective of deriving the safe limit of vibration intensity for vehicle passenger comfort (252). Claiming that rubber is potentially the best springing material for vehicles known today, one author (253) urges that the time is ripe for introduction of rubber into vehicle suspensions particularly because of the current importance of such suspensions in design and the adoption of independent front suspension. A vibration-control unit with a load capacity ranging from 25 to 125 pounds per unit is said to provide greater horizontal stability than all-rubber mountings. The new mounting utilizes a conical spring molded within the rubber (254). Load deflection factors in the design of rubber suspension units have been given consideration (255), and in a study of rubber anti-vibration devices attention is directed toward the theory of elastic suspensions and how rubber can be applied practically to such applications (256). The rubber torsilastic suspension system also has been given further study (257).

Proper molding technique for the production of O-ring hydraulic packings which require close tolerance has been pointed out (258); while the factors affecting the performance of aircraft hydraulic packings have been reviewed (259). Development in rubber materials for gaskets since 1939 has proceeded along two lines: the improvement in existing materials such as copolymerization of chloroprene with isoprene to give a material (Neoprene-FR) with better resistance to cold; and the development of new material such as the Silastics with resistance to both high and low temperatures (260). Rotproof gasket material that remains pliable and resilient under cold weather conditions and long service consists of Fiberglas cloth coated with rubber. It has been installed on the vertical and windshield edges of folding doors of school buses (261). A check valve utilizing a flexible tubular operating member effects positive bubble-tight shut-off and permits unrestricted streamlined flow (262). Chemically-blown sponge rubber, as applied to engineering design, has been dealt with, particularly in respect to its use for automotive sealing, cushioning, and vibration damping problems (263). An automotive seat and seat back consisting of an inflated airbag overlaid with foam rubber is claimed to give greater riding comfort (264). Basic lubrication principles being used for other applications have been utilized in rubber stern bearings to improve the wearing qualities substantially (265).

Although none of the synthetic rubbers and resins are perfect as insulation, it has been said that their proper use will result in more reliable and longer lasting wire and cable insulation (266). GR-S-65 has been presented as a special-purpose copolymer with low water absorption and soap content which make it superior for the manufacture of insulated wire and cable (267). A new submarine cable employs Telcothene, a mixture of polythene and polyisobutylene, as the main insulating material (268). A lightweight neoprene jacketed bore-hole and mine entrance cable utilizes aluminum instead of copper, permitting a 30 to 50% saving in cost and 50% saving in weight (269). A detailed study has been presented on rubber as a material of construction (270).

The use of rubber in architecture and building has also been treated (271). New evidence has been presented in favor of rubber in asphalt road compositions based on road surfaces laid in 1938 (272). A report has appeared on latex with Portland cement for indoor flooring (273), and a procedure has been outlined for carrying this out satisfactorily.

Considerable attention has been given to the use of rubber, its derivatives and related synthetic polymers in paints and protective coatings (273-280). Practical experience on the use of synthetic rubber-base inks has been reported (281). Applications based on latex include curled animal hair bonded with rubber (282), impregnation of paper (283), and production of artificial leather (284). The application of rubber thread to textiles (285) and the durability of rubberized cotton and cellulose acetate in fabrics (286) have been treated. Rayon tire-cord fabrics have been given increased adhesion toward rubber by recent methods (287, 288).

[1] Presented before the Rubber & Plastics Division, A.S.M.E., New York, N. Y., Nov. 30, 1948. In accordance with the policy of A.S.M.E. which aims to have future papers of this nature cover the literature from June of one year through the following June, the present paper begins where "Advances in Rubber in 1947" ended, *viz.*, October, 1947, and continues through June, 1948.

[2] General Tire & Rubber Co., Akron, O.

[3] Numbers in parentheses refer to similarly numbered references in bibliography at end of paper. Unnumbered, supplementary references are found with related articles in the bibliography.

Extensive work has been done on the bonding of rubber to metal and a number of studies, some of them highly detailed and comprehensive in nature, have been made available (289-296). The bonding of latex to wooden surfaces has also been covered (297). Several studies have been presented on properties and applications of industrial adhesives for various applications (298-300).

Silicone elastomers have come in for further attention, particularly in relation to the extension of their unique properties to difficult design problems (301-307). Emphasis has been placed on the exceptional thermal stability of the silicones and their resistance to deletorious effects of weather, oil, chemical, etc. The silicone rubbers and their mechanical properties, swelling characteristics, electrical properties, and ability to adhere to glass are described with reference to applications in hydraulic seals, belting, coated fabrics, gasketing, and electrical devices (308). Especially suited for low and high temperature service, the silicone elastomers should not generally be used where the temperature application is between —25 and 125° C. In a further application study of the silicone rubbers, consideration is given to the basic stability of these materials to high and low temperature and to the effects of weather and oils (309). The inherent stability of these polymers is suggested by reference to chemical structure and bond energy between silicon and oxygen atoms, as well as the fact that special compounding is not necessary to produce stocks resistant to many conditions. Silicone rubber is bonded to itself and to glass, metal, and ceramics by a new silicon-type adhesive that remains flexible and resilient over temperatures ranging from —70 to 520° F. (310). Silicone sponge rubber, furthermore, is claimed to maintain its properties and flexibility over a wide range of temperatures (311).

A highly flexible neoprene polishing wheel is said to be effective for finishing stainless steel, glass, and nonferrous and precious metals (312). By encasing a cast aluminum or bronze core in rubber, a propeller for outboard motors is rigid enough to cut the water, yet sufficiently resilient to slide over weeds without fouling and to bounce over obstacles without shearing the drive-shaft pin (313). A belt with rubber teeth for use with grooved pulleys is said to prevent belt slippage (314); while a ribbed-top conveyer belt has been designed to prevent backslip in carrying sand and gravel, wet-mixed concrete, gold dredging, and other "soupy" materials up steep inclines (315). A hot-materials conveyer belt is cushioned with rubber and straightened with glass-fiber fabric (316). An impact-cushioning idler for belt conveyers consists of rubber rings mounted on the idler core instead of the conventional rubber-covered steel idler (317). Maximum deflection is said to be about six times greater than with the standard type.

A new glass cord steam hose, which will carry saturated steam at temperatures of 388° F. at a pressure of 200 pounds, utilizes Fiberglas cords 25/1000-inch in diameter to give a wall only 9/32-inch in thickness (318). A hydraulic hose for aircraft hydraulic applications uses special steel wire with a tensile strength of over 400,000 p.s.i. and is said to withstand pressures in excess of the 3,000 p.s.i. needed in operation (319). A considerable number of plastics and elastomers have been tested for permeability to tetraethyl lead and ethylene bromide with a view to making better protective work gloves (320). Other application treatises have dealt with food packaging (321), gas masks (322), non-metallic fuel tanks for aircraft (323), rubber lining (324), and meteorological balloons (325).

General Outlook

Last summer the Office of Domestic Commerce revised upward expected 1948 United States consumption of new rubber, natural and synthetic, to 1,050,000 long tons, and foreign demand was placed at 825,000 long tons. The current position of natural rubber *vs.* synthetic is reflected in United States consumption figures for June, 1948: natural rubber, 55,701 long tons; GR-S, 30,439 long tons; Butyl, 5,370 long tons; neoprene and nitrile types, 3,395 long tons; or a total of 94,905 long tons. Mandatory use of GR-S and Butyl rubber, now restricted to transportation uses, amounts to less than 30% of total new rubber consumption. In June, 1948, the rubber industry voluntarily consumed 8,547 long tons of GR-S and 3,501 long tons of other synthetics for non-transportation rubber articles.

A new law, known as the Rubber Act of 1948, became effective on April 1, 1948, and expires on June 30, 1950 (326). It is interesting to note that this law states:

"It is further declared to be a policy of the Congress that the security interests of the United States can and will best be served by the development within the United States of a free, competitive synthetic-rubber industry."

Despite this statement of intent there appears to be considerable doubt regarding the disposition of our synthetic-rubber producing industry and the termination of government ownership.

Rehabilitation progress on natural rubber-producing areas of the Far East as well as Malayan rubber policy and pricing of natural rubber have been the subject of discussion (327-330). The relative merits of GR-S and natural rubber have been compared (331), and the impact that synthesis may have on the rubber industry as a whole has been pointed out (332). Another study deals with the relation of rubber and plastics, emphasizing selection based on application (333).

An authoritative and comprehensive study of the structure, techniques, economics, history, and prospects for the rubber industry from 1929 to 1947 has been presented, emphasizing monopolistic control of rubber, the principal aspects of future competition between synthetic and natural rubber, and the present position and future prospects of the industry as a whole (334). In reviewing the government's activity in the rubber field, the functions of the Office of Rubber Reserve have been reviewed (335). The postwar status of the rubber manufacturing industry in Europe has been outlined (336), and the position of rubber science and technology in the Netherlands during the war has been reviewed (337). Revolutionary developments in the rubber industry are said to emanate from fundamental objective research; stead progress, on the other hand, is stated to be the likely result of inspired empiricism and applied research (338). Several studies of general interest cover a second, revised edition of a book on rubber science and technology (339), work of the British Rubber Producers' Research Association (340), education and training in the rubber industry (341), and a discussion of nomenclature as related to synthetic rubber-like polymers (342). Mention also should be made of four excellent reviews on rubber technology which appeared in the literature this past year (343-346).

This survey gives evidence, through the extent of research and development effort expended in these few post-war months, that progress in rubber technology is moving forward. In conclusion, it should be emphasized that the period 1947-1948, while otherwise unspectacular in rubber technological advances, saw the development of a synthetic elastomer definitely superior to standard GR-S. Just how seriously this new rubber

made by low temperature polymerization may affect the position of natural rubber still remains to be seen.

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[4] Abstract only.

EDITORIALS

Business-Government Relation and the Government's Role in Our Economy

THE need of an improvement in the relations between business and government and the need of a criterion to determine the future role of government in our economy, two problems important to every American in every walk of life, were discussed in a thought-provoking talk made by John L. Collyer, president of The B. F. Goodrich Co., before the Economic Club of New York on March 10. Because we believe that many readers of India RUBBER WORLD may not have an opportunity to consider the points made in this talk otherwise and because it would be hard to find two subjects of greater interest to the rubber industry and the country as a whole at this time, we are devoting our editorial page this month to the quotation of significant excerpts from Mr. Collyer's talk.

"What should we do—what can we do—about the relations between business and government? Are we going to permit them to deteriorate until it is too late to salvage the principles that have meant so much to the American people, or are we going to find constructive solutions that will promote sound material progress with individual liberty?" Mr. Collyer asked.

"The major challenge that we face has to do with the manner in which our American economy shall function in the future. No American can afford to be indifferent to this challenge. The future equilibrium between business and government will affect him whether he be a minister or an executive, a tire builder or a farmer.

"Should not this future equilibrium continue to rest upon these fundamental principles which are our heritage and in which we all believe?

"That the freedoms we enjoy are our most priceless heritage?

"That the door of opportunity should be open to all.

"That competition and incentives are necessary to progress.

"That a stable government should provide the rules by which we live together; that it should provide recourse against abuses within, and safety from dangers without.

"That ours should be a government of laws, not men."

It was pointed out that cooperation between business and government is essential, and in this connection there are things that business can do and things that government can do.

"In many of the activities of government that affect business, there is a need for much greater consistency.

"It would be a great aid to improved relationships if business could feel that government decisions and actions reflected objective and impartial consideration of facts.

"By its acts government can show its understanding that the unparalleled success of our economy and our people flows from the primary motivation of personal gain.

"Government can improve the relationship with business by its concern with conditions that help or retard business activity, recognizing that the financial support of government is wholly dependent upon the income of the people.

"We must face the question of whether the American economy can carry existing, or even greater financial burdens, without the force of compulsion replacing the freedoms we cherish so highly. In 1949, our government at national, state and local levels is taking approximately $60,000,000,000 of our total income estimated at $215,-000,000,000 or 28¢ out of each dollar.

"There are qualities required of businessmen in their relationship to government which are counterparts of the qualities of consistency and impartiality that we ask of government. The temptation may be strong to deal with government on the narrow base of special interest. Should not a broader view be taken, however, and concern for the interests of the American people be reflected in our dealings with government?

"Let us remember that when government is in the process of arriving at national policy that will stand the test of business experience, it is the adequacy of understanding of the problems that counts.

"It would, I believe, be helpful if businessmen were to set aside a certain percentage of their time to present to government facts and more facts by whatever methods they find most helpful—remembering that persistence and courage in presenting views are often required.

"The obvious points that I have mentioned make for improvement in the relationship between business and government. But there is a major step that should be taken because it goes to the very heart of the problem that is dividing Americans—the conflict of views as to the government's role in our economy.

"We are now witnessing the probable solution of a most important problem that was attacked on a non-political basis: namely, how to obtain efficiency in the vast executive branch of our federal government. Both political parties voted unanimously in Congress to create a commission to study this problem and to recommend a solution. Men of the highest integrity and competence, enlisted from both political parties, took this task. They are now presenting their recommendations to Congress and also to the people so that they may form their judgments and bring their influence to bear. But it is the prerogative—as well as the responsibility—of Congress to take the necessary action.

"I submit that this approach holds great promise of developing the criteria we need to determine what can wisely and safely be the role of government in our economy.

"It is with the utmost sincerity that I recommend that the 81st Congress embark on such a non-political undertaking, with a clear statement of national policy that is focused on the preservation of the freedoms of the American people."

DEPARTMENT OF
PLASTICS TECHNOLOGY

Trends in Design of Plastics Extrusion Machinery and Controls[1]

Albert A. Kaufman[2]

IN ORDER to compete successfully with other methods of production as well as with old-established raw materials, recent trends in the design of machinery for hot, dry plastics extrusion have been dominated by one factor, better yields; i.e., more pounds per hour with the same labor cost, with less rejects and less set-up time.

At low yields with slow machine speed it is possible to produce even those intricate cross-sections with close tolerances that are dreamed up on paper by some of our brother engineers in other fields. Low yields can mean too slow machine speed or too small a machine, but more often result from the selective inspection production method; i.e., to deliver only that fraction of the produced quantity which happens to be within the tolerances. Close tolerances on the finished extruded product at good production rates are not exclusively the result of proper machine design and controls, but depend to a certain extent on specialized take-off mechanisms and techniques with which this paper is not concerned.

The general trends in plastics extrusion machinery follow: (1) larger machines; (2) increased efficiency of smaller machines to give more pounds per horsepower; (3) use of the screw-type extruder not only for shape extrusion, but also for preforming, pelletizing, continuous compounding, injection molding, and blow molding.

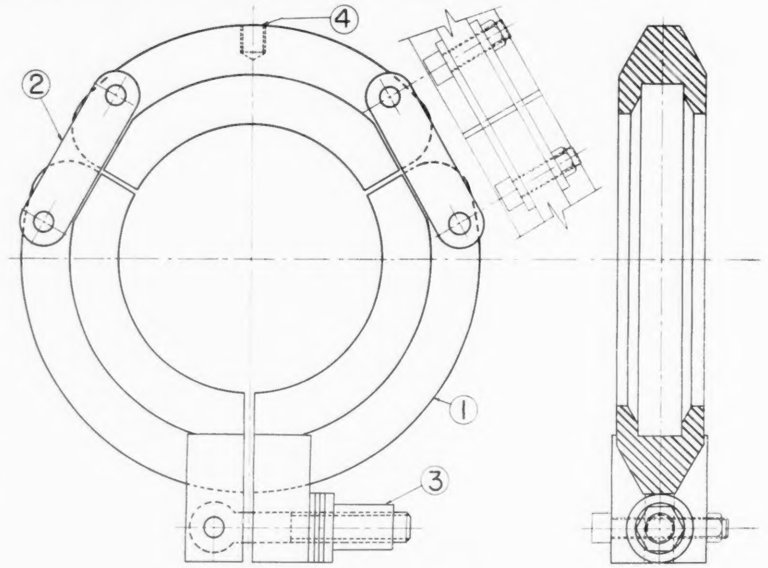


Fig. 1. Split Ring Clamp

1. Pressure Flange; 2. Swinging Connecting Links; 3. Tightening Nut; 4. Threaded Hole for Eyebolt

Motors and Drives

In motors, variable speed units are generally regarded as being most desirable. AC-DC motor generator units, because of their excellent torque - speed - horsepower characteristics, are superior to mechanical vari-drives of the variable sheave type. The speed ratio should range from 1:1 to at least 4:1 in order to facilitate slow starts. The importance of slow starts cannot be over-emphasized since it is imperative to establish a given temperature balance of the various machine elements before obtaining satisfactory production.

The best drive is the herringbone gear type because it is sturdy, efficient, fairly silent in operation, and has a low maintenance cost. All larger machines of recent design have herringbone drives.

The thrust bearing should be readily accessible, well lubricated, and thermally insulated from the extrusion cylinder. This insulation is usually accomplished by means of spacer rings and water-cooled back sections in the extrusion cylinder.

Heating Cylinder

The heating cylinder should be hard-lined with Willrich 306, Hastelloy, or similar alloys. These alloys possess good resistance to corrosion, necessary because of the corrosive properties of some plastic materials when under heat and pressure. These metals do not catalyze the decomposition of such plastics as polyvinylidene chloride, polyvinyl chloride, and polyvinyl chloroacetate. Furthermore they have a low coefficient of friction which minimizes the development of frictional heat. Frictional heat is hard to control and is the cause of many difficulties, particularly depolymerization and decomposition of materials.

In order to obtain optimum heat transfer a tight fit is required between liner and cylinder. The thermal expansion of the materials used in the cylinder and liner should not allow a loose fit to develop after heating.

The design of the front section of the cylinder should provide easy and rapid mounting and dismounting of straightheads, crossheads, goosenecks, sheet dies, etc. Clamping rings with their numerous screws or bolts are hardly condusive to quick changes. A time-saving quick-change clamp has been designed by E. Green, of Hartig Engine & Machine Co., in collaboration with my company (see Figure 1). The entire die section is held by a split ring clamp tightened with one bolt and nut, a design feature superior to the hinge type or conventional clamping rings.

The transition of the straight cylinder into the die head section should be well streamlined, with no undercuts or pockets in which material can collect and stagnate. The cross-section from cylinder diameter to die orifice should converge gradually in order to facilitate the flow of the softened material without turbulence. Breaker plates and screens are recommended for some plastic materials. It is my opinion, however, that a circular restriction of the cross-section at the end of the cylinder through which the material must flow is better than a breaker plate with its flow shadows. This topic will be further discussed in connection with screw design.

Heating Systems

The choice of heating system for a plastics extruder is governed by the following considerations:

(1) The required maximum temperature of the material or materials to be run. The heating system should be designed to give at least 50° F. more heat than the required working temperature, since it has been found practical in many cases to start the machine at a temperature higher than the maximum working temperature.

(2) The heating system should be efficient; i.e., it should give a maximum heat transfer in a minimum time. This requirement is important because many plastic materials have limited thermal life. Under the influence of heat, materials show a change in properties ranging from a change in viscosity, to continued polymerization, to actual complete decomposition. This factor necessitates thorough machine cleaning after the shut-down period because the

[1]Presented before annual technical conference, Society of Plastics Engineers, Inc., Philadelphia, Pa., Jan. 21, 1949.

[2]President, Industrial Synthetics Corp., 225 North Ave., Garwood, N. J.

subsequent heating-up period might be long enough to cause these material changes.

(3) There should be provisions to cool down the machine rapidly enough to avoid decomposition of the material in the machine after completing a run.

(4) Simplicity of maintenance, cleanliness, and space factor are also very important.

Let us consider the advantages and disadvantages of commonly used heating media. Steam, as a heating medium, is widely used because of its efficiency, economy, and good temperature stability. Heating up and cooling down cycles of the machine are rapid. For some plastic materials, however, the temperatures practically obtainable with even 200 pounds of steam pressure are inadequate. Furthermore separate boiler installations with their maintenance, fuel storage, and other problems are necessary.

Heat transfer oil, electrically or gas heated, is another widely used medium, but necessitates the use of a thermostatically controlled oil circulating system with a pump and expansion tank. Oxygen should be kept out of the system, and this condition can be accomplished by having return pipes deeply immersed in the oil reservoir and using relief vacuum valves at the highest point of the system. Electric immersion heaters should not be dimensioned over 20 watts/square inch in order to prevent their surface temperatures from overheating, cracking, or decomposing the oil. The working temperature limit of this system is approximately 450° F., and at this temperature oil changes are necessary after each 500-1,000 hours of operation. If higher temperatures are used, disturbing fumes emanate from the system, and the rapid decomposition rate of the oil requires more frequent oil changes.

The slowness of the heating-up period with oil has been improved by by-passing the extrusion cylinder and heating up the circulating system to a temperature of 50-100° F. above the desired working temperature. When the desired temperature is reached, the circulating valves of the extrusion cylinder are opened. Cooling of oil heated machines can be accomplished by circulating water coils placed inside the oil reservoir, or preferably by a separate cold oil reservoir connected to the circulating oil system. Obvious disadvantages of this oil heat transfer system are high maintenance costs; leaking connections, especially at pump packings at elevated temperatures; and low efficiency.

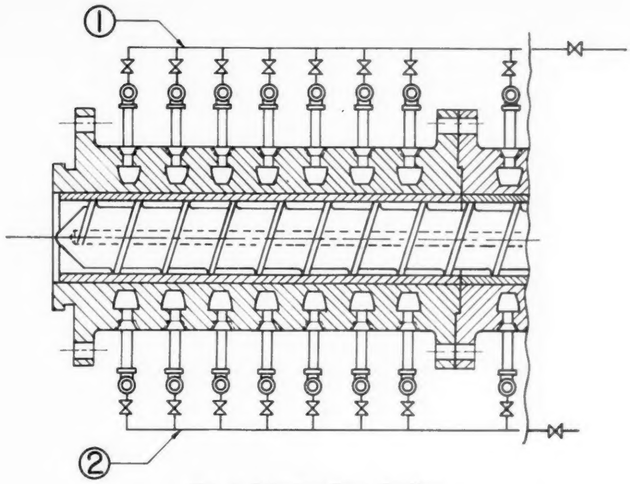


Fig. 3. Selective Zone Cooling
1. Coolant Outlet Header; 2. Coolant Supply Header

The advent of excellent new heat transfer liquids, such as the silicones, opens new horizons for circulating heat systems. The known disadvantages at this time are greater possibility of leakage than with heat transfer oil, and the relatively high price of silicone itself. Despite these disadvantages it is to be expected that we will see silicone heated extruders having considerably more compact and efficient heating systems.

The latest design trend has been toward direct electrically heated cylinders, using band, strip, or cartridge heaters (see Figure 2). This heating method provides operating temperatures up to at least 700° F. and is efficient, clean, and self-contained.

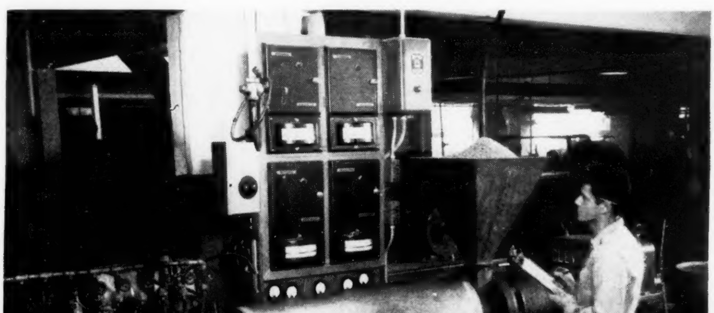
A cylinder designed for electric heat requires heavy walls for proper temperature balance. As is known, steam and oil not only inject heat, but also carry it away; steam acts more quickly and efficiently than oil. Since the electric heater will only inject heat, it is necessary to provide some means to cool the cylinder. This condition has been achieved by several methods: one is longitudinal coring of the cylinder casting to permit the circulation of steam, water, or air; and another is the system of sectional coring as designed by Modern Plastic Machinery Corp. (see Figure 3).

On machines of our own design we achieve zone cooling by means of several helical grooves in the cylinder which house tightly fitting cooling coils. The Modern Plastic machine heating and cooling system, however, is the most versatile because its 13 separate zones can be connected together from the outside, allowing any combination of zone lengths for heating and cooling purposes.

Temperature control on these machines is achieved by proportioning electronic pyrometers whose thermal elements are located throughout the cylinder. The Wheelco Instruments Co. pyrometer has given good service, has excellent readability, and is designed for ready replacement of its components. Rotary switches controlling several thermocouples in one heat zone are a great convenience in controlling the uniformity of thermal equilibrium.

Dowtherm, another heat transfer medium, is to my knowledge not being used commercially at this time for extrusion machinery. Dowtherm is recommended for temperatures above 400° F. because the liquid-to-gas range of this medium is 350-400° F., the working temperature for many plastic materials. Furthermore, since some plastic materials have an affinity for outside odors, it is necessary to obtain a very tight system using welded pipe connections because Dowtherm has a tendency to escape through standard fittings. Dowtherm has excellent heat transfer properties; one immersion heater and one cooling coil in the jacketed reservoir of the section to be heated are adequate, and a circulating pump may not be required.

It is worth while to investigate Dowtherm further as a heating medium since it allows a compact design and is practical for self-contained heating of machine head attachments, such as crossheads, goosenecks, etc. These attachments are not too easily and uniformly heated by direct electric heat supplied by cartridge or strip heaters.



Extrusion Machine with Electrically Heated Cylinder

Screw Design

Screw design is a controversial subject as there is no such thing as a universal screw design that will be satisfactory for all plastic materials. Some basic considerations, however, seem common to all designs.

Screws are made preferably of stainless steel; the flight lands are hard surfaced

with Stellite, Toolweld, or other suitable metals. The clearance between screw and cylinder should be kept to a minimum since excessive clearance results in material adhering to the cylinder wall and a reduction in output rate. Since most plastic materials are poor heat conductors, the extrusion screw should be shallow in order to allow the greatest possible material surface to contact the heated cylinder wall. The pusher side of the screw flights should be as close to a 90-degree angle in relation to the root as possible. Some pusher flight designs are even undercut.

The efficiency of an extrusion screw is determined by the angle of the flights in relation to the flow direction of the material. A long pitch gives a less positive advance and lower pressures than a shorter pitch since the material can back-slip more easily. This factor explains the increased yield of single-flight screws. The double-flight screw is more difficult to manufacture, and there is always the danger that the volumes of the two flights will be unequal, resulting in variations at the die.

Experiments with several materials, such as cellulose acetate, polystyrene, polyvinylidene chloride, and polyvinyl chloride, have not shown any results favoring the double-flight screw, either in output per hour or in regularity of product. In the case of cellulose acetate a double-flight screw gave a more uniform extrusion at a lower yield than a single-flight screw. The latter, when slowed down to the output rate of the double-flight screw, gave equivalent regularity.

The bulk factor of the material to be extruded determines the variation in pitch of the screw, or the degree of taper of the root at constant pitch. The compression ratio of the screw should not be greater than needed to guarantee a homogeneous extrusion without voids and should not be considerably greater than the bulk factor of the material.

Much difference of opinion is encountered over the use of a torpedo or muller at the end of the screw. In my opinion, long torpedoes, as incorporated in the designs of one machine manufacturer, are not desirable since they lower the production rate. Short torpedoes are generally better than no torpedoes at all and have proved advantageous, especially in large machines, since they allow a gradually converging cross-section from screw diameter to die section. A short torpedo having a diameter larger than the root of the screw, forming a circular restriction, performs the functions of a breaker plate by equalizing flow variations coming from the screw. Furthermore the short torpedo will complete the process of fluxing and homogenizing the material shortly before it enters the die. Such a flow channel can be made stationary by using a well-streamlined spider.

More and more attention is being given to the heating and cooling of screws since frictional heat in the screw must be controlled. This control is effected successfully by using water or steam, and some development work is now being done to control screw heat by zones in order to make the cooling rate conform with the plastification stage of the material.

In discussing the screw and cylinder, it should be mentioned that pelletized materials give more uniform extrusions and, in some cases, better yields than granulated materials. An interesting unit of this type has been offered by Modern Plastic Machinery Corp. and consists of a device through which a number of extruded rods are simultaneously fed and sliced into pellets.

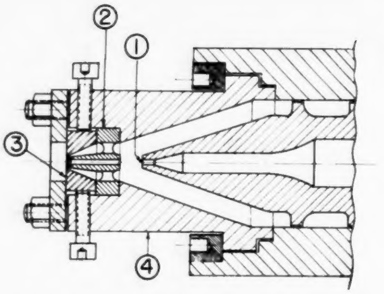


Fig. 4. Die and Guider Tube for Straight Head Jacketing
1. Screw Mouthpiece; 2. Guide Spider; 3. Die with Centering Screws; 4. Die Head

Crosshead Jacketing

The crosshead is an important attachment of the extrusion machine since it is used to cover wires and cables, but it has also enlarged the usefulness of the extruder by combining thermoplastics with other materials.

To eliminate some of the disadvantages of the 90-degree head, the general trend is toward the 45-degree and even 30-degree crossheads for the following reasons:

(1) Because of the smaller deviation angle the flow differential between inner and outer radius of the deviation bend is smaller, thus assuring more uniform delivery of material to the die.

(2) The smaller angles substantially reduce the danger of material stagnation on the outer bend because the frictional resistance is lower. This condition facilitates the flow of material at this point and completely eliminates the need of a bleeder gate.

(3) The general lower frictional resistance in the smaller-angle crossheads results in increased output and reduced cleaning time.

(4) The small-angle crossheads give a saving on floor space.

With all these advantages the 30- and 45-degree crossheads still retain some of the disadvantages of the 90-degree crosshead: namely, the unfavorable flow condition created by the guider tube around which the material must flow, and the somewhat reduced output compared with straight head jacketing. Any crosshead should be designed so as to permit disassembly from the guider tube side for cleaning purposes without disturbing the centering device or die.

Straight Head Jacketing

A method to accomplish straight head jacketing is shown in Figure 4. This method necessitates the use of a specially designed rotary joint for the heating or cooling medium of the screw. In addition, the mouthpiece at the tip of the screw must not permit backing up of material into the screw guider tube. From the mouthpiece the material to be coated goes through a spider which is stationary and holds the centering guide which leads into the extrusion die. It is not advisable to guide from the rotating screw guider tube directly into the extrusion die because the whip of the screw tip will continuously throw the wire or other material to be jacketed off center. For other than round forms quite complicated rotary joint guider tubes must be designed. Since the structural strength of the screw is reduced by large inside bores, this factor limits the diameter of materials which can be coated by this method.

The secret of success in straight head jacketing lies in having a short distance from screw tip through guider tube to die, in order to permit cleaning of the guider tube from the die end without dismantling the machine head if any backing up of material occurs.

Consideration of the above-mentioned and other shortcomings of both crosshead and straight head extrusion has led to the development of the more efficient conical screw extrusion machine which is briefly discussed later in this paper.

Head Attachments

With goosenecks and sheeting dies for vertical extrusion, the flow conditions are more favorable in a 90-degree crosshead because there is no guider tube to disturb the flow of material. The difference in pressure between the inner and outer radii of the bend can be compensated for by proper flow design of the attachment.

Sheet extrusion of cellulose acetate and cellulose acetate-butyrate has been pioneered by Tennessee Eastman Corp. and has been described in great detail in the company's literature. Great strides have been made and continue to be made in polyethylene film extrusion, and to my knowledge several die designs are in use. One of them is vertical flat-sheet extrusion through a relatively simple spreader tube. Films up to 54 inches wide and 0.001-0.004-inch thick have been extruded at good production rates on an extruder having a 4½-inch diameter screw. Another method uses a vertically extruded tube blown up against an expansion die. Sheets as wide as 108 inches and 0.002-inch thick are reported to have been produced by this method.

The thermal stability of polyethylene does not necessitate elaborate streamlining of film extrusion dies. Slower progress has been noted with polyvinyl chloride and polyvinyl chloro-acetate which require extreme streamlining and flow control in order to obtain good uniformity and reasonably good surface finish. With these vinyl materials it appears that the film field belongs to the calender at this time. In the extrusion of sheets, however, interesting applications may be realized.

It may be expected that for some applications in the heavy sheeting field two extruders placed side by side might feed one wide sheeting die in order to overcome some of the material flow problems.

Multicolor Extrusion

Several methods for making multicolor extrusion are in use. One method consists of horizontal side by side extrusion of different colors, achieved by means of several small extruders, each delivering a different colored compound into a common die. Another production process to obtain this effect consists of a hydraulic cylinder which forces a different colored compound into the extrusion die.

Another type of multicolor extrusion consists of two horizontal extrusions which emerge parallel one above the other from the same die to give tapes or shapes which have different colors on their under and upper surfaces. This condition can be achieved by twin-screw extrusion or by using the crosshead as a continuous heat sealing machine. In the latter case one color is extruded separately, fed into the formed guider tube, and from there directed upon the hot extrusion of the second color just before it leaves the extrusion die. This process has proved successful in extrusion of flexible vinyl chloride compounds, but the process can also be applied to other materials.

Other Uses of Extrusion Machines

Large tubes up to 10 inches in diameter

in non-continuous lengths are being produced by an extrusion-injection molding method by Carter Products Corp. Further development of this process for large castings is to be expected.

Apart from the other contributions Plax Corp. has made to the extrusion field, one of the most ingenious uses of its extrusion machines has been for blow molding, particularly in the production of the squeezable polyethylene vaporizers.

A trend toward using large-size extruders for continuous raw material compounding is quite evident. Farrel-Birmingham Co. recently manufactured for this type of work an extruder which has a 20-inch diameter screw and is nearly 31 feet long, not counting the drive.

It may soon be possible to compound and extrude to shape in the same machine if further design improvements will allow entrapped air to escape through the feed end of the machine, and if compounds can be formulated which will not generate excess gas.

Conical Extruder

We have developed a new machine, the conical extruder,[3] which we consider to be, for the time being, the most desirable machine design. This electrically heated machine consists of a conical cylinder and screw having a taper of more than 10 degrees. The liner and screw flight lands also have the same angle of taper. The screw flight lands are hard surfaced, and the liner has hard alloy sections at its largest and smallest diameters.

This machine principle has the following advantages over a straight bore extruder:

[3]Patents applied for.

(1) Screw and liner run practically without clearance and, therefore, do not allow any material to remain on the cylinder walls or between screw flight land and liner.

(2) Because of the taper, the surface speed of the screw is much higher on the feed section. Frictioning of the cold material is therefore more intense, and plastification is accelerated. On the other hand, as the material progresses along the taper and is heated up, the danger of decomposition of heat-sensitive materials because of uncontrollable friction heat is considerably diminished. This uncontrollable friction heat is certainly the Number One enemy of extrusion.

(3) The machine gives more positive material advance with no back-slip.

(4) The machine is practically self-cleaning.

(5) A spider or core holder is not necessary for tubular extrusions, thus assuring unrestricted flow conditions which indicate the durability of the machine for extrusion of thermosetting materials.

(6) Crossheads with their disadvantages are unnecessary since the screw is strong enough mechanically to be inside bored for straight head jacketing. Separate spiders and guider tubes are not needed since the screw always runs concentrically.

(7) The machine gives more output per horsepower than any other machine known to us.

I am not free to give more than a sketchy outline of what this most versatile of all extrusion machines can do, but insofar as possible will gladly answer questions on this machine and other topics discussed in this paper.

Prominent Speakers at SPE Sections' Regular Sessions

TWO technical talks featured the March 8 meeting of the New York Section, Society of Plastics Engineers, at the Hotel Sheraton, New York, N. Y. Approximately 48 members and guests heard Bruno E. Wessinger, president of Wess Plastic Molds, Inc., speak on "Problems of a Mold Maker," and Frank J. Donohue, technical service manager for thermosetting molding materials, Monsanto Chemical Co., discuss "Trouble Shooting of Molding Problems."

Mr. Wessinger stated a mold maker should take his jobs from the molder, rather than from the customer. The mold design should be worked out by the molder and maker, and mold prints made and approved by all parties before any work begins. The following points are suggested to help keep mold costs down: (1) keep cut-offs on one level to aid machining and permit grinding of cavities and forces after hardening, a procedure which results in better cut-offs and less possibility of flash; (2) see that the steel walls of the mold are not too thin, thus avoiding warpage and breakage during heat treating; (3) avoid over-elaborate molds which save a little work on a molded piece, since such molds are expensive to make and maintain; (4) avoid doing too much with one mold by putting in different inserts, cavities, etc., since this practice increases cost; and (5) the molder should decide how the sprue bushing should be fitted, how the runner should be shaped, etc., before the mold is begun, since such factors usually can be incorporated in the mold at no extra cost, but are expensive if done after the mold is finished.

In estimating the cost of a mold, the mold maker must first be given all the data on the mold. Since many estimates include breakage of two or more hobs, the molder should request an estimate based on the use of one hob and agree to pay separately for any additional hobs needed for the job. Delivery dates of finished molds are a constant source of irritation, the speaker said. Promised delivery dates cannot always be kept, but the molder should bear in mind that the mold maker is doing his best to finish the job quickly, and that little can be gained by trying to hurry matters. As regards mold responsibility, Mr. Wessinger stated that any mold used in production for 50 hours should be considered satisfactory. Any defects in the mold due to faulty workmanship will show up in that length of time and should be adjusted by the mold maker.

Mr. Donohue's talk was identical with the paper he presented before the SPE National Conference on January 21, and abstracted in our January issue, page 477.

President Stanley Bindman, Noma Electric Corp., presided over the meeting, which began with a brief business session during which reports were heard from Secretary-Treasurer George Barron, Ideal Plastics Co.; Membership Committee Chairman George Rice, American Cyanamid Co.; House Committee Chairman Edward V. Walsh, Tech-Art Plastics Co.; and Program Committee Chairman G. Palmer Humphrey, consultant. Table favors in the form of combination plastic rulers and pencil sharpeners were distributed through the courtesy of Mike Miller, Miller Plastics Co., and the drawings for door prizes included a gift donated by Vice President Sam Silberkraus, Regal Molding Corp.

Thomas and Connor Address Newark Section

Ninety members and guests of the Newark Section attended a dinner-meeting on March 9 at the Newark Athletic Club, Newark, N. J. The technical session featured two speakers: Islyn Thomas, Thomas Mfg. Co., gave "A Review of Current Plastics Conditions in Europe"; and Walter J. A. Connor, U. S. Fiber & Plastics Corp., spoke on "Trouble Shooting in Molding."

Mr. Thomas's talk, based on his recent trip to Europe, began with a general comparison of European and American economies. In the plastics field, France has been hampered by her low standard of living, a lack of comprehension of mass-production methods, general inefficiency, and a striving for artistic perfection which results in over-complicated designs. England's plastics industry, while small and somewhat out-dated as compared with our own, is growing rapidly and may soon provide competition in the export market. The speaker concluded by stating that American technical skill and mass-production methods will make our plastics industry the world's leader for many years to come, but continued effort and improvement are needed to insure continued superiority.

Mr. Connor dealt with problems involved in the molding of thermoplastics and stated that the solution of these problems requires mental elasticity, imagination, and mechanical intuitiveness. The speaker listed the common molding problems as being sticking of the sprue; sinking or shrink marks; surface specks; poor welding; interior bubbles; dull finish; surface waviness; cloudy surface; short shots; flash; sticking of moldings in the cavities; warpage of pieces after molding; oozing of material from the nozzle; surface flow marks; and lack of shop cleanliness. The probable causes of each problem were given together with their remedies.

In the business session, President Harold Frutchey, Thomas Mfg. Co., announced that the Section now has 234 members, second highest in the Society. Mr. Frutchey also revealed the appointment of John Groesbeck, American Hard Rubber Co., as publicity chairman, and Joe Myers, as program chairman starting with the November meeting.

Room-Temperature Curing Resins

Approximately 60 members and guests of the two societies attended a joint dinner-meeting of the Chicago Section, SPE, and Midwest Chapter, SPI, on March 9 at the Builders' Club, Chicago, Ill. Speaker of the evening was Irving E. Muskat, president of Marco Chemicals, Inc., who discussed "Room-Temperature Curing Resins."

Dr. Muskat described these resins as liquids which, when mixed with catalyst, will cure or set into solids that are no longer soluble in ordinary solvents and do not soften with heat. Since the resins cure without the application of heat or pressure, the only equipment needed is a simple method for stirring the catalyst into the fluid and pouring the resultant mix into molds before it sets. Many materials can be used to mold these resins, including magnesia block, concrete, plaster, polyvinyl chloride, and lead. Properties of the resins can be varied widely by incorporating different

fillers on fabrics. Tensile strength can be increased greatly, electrical properties varied, and the resin can be made fire resistant by using proper fillers. Ease of fabrication permits production of products which could not be made so cheaply and so well by other means.

Following the talk, a motion picture, "Northwestern University Football Highlights of the 1948 season," was shown, with a commentary by Eddie Tunnicliff, a member of the team.

New Officers for Indiana Section

The Northern Indiana Section held a dinner-meeting on February 18 at the Van Orman Hotel, Ft. Wayne. Featured speaker was James H. Hawkins, Monarch Life Insurance Co., who discussed "The Role of Life Insurance in Business." Money is always a problem in business, Mr. Hawkins said, and life insurance can make money available when it is most needed. Insurance is needed most in business by sole proprietors, partnerships, small closed corporations, and key men, since the death of anyone in these four categories usually results in a forced liquidation of the business at a monetary loss.

This meeting was the first since the Section's recent election of new officers and directors, as follows: president, Wayne Pribble, Barrier-Pribble & Co., Inc.; vice president, Cecil Armstrong, Armstrong Plastic Co., Inc.; secretary-treasurer, Walter Schaefer, Wayne Plastic Products; and directors, in addition to the officers, Alvis Barrier, Barrier-Pribble, Frank Butters, General Electric Co., Karl Koehler, Wayne Plastic Products, Ferris Neuman and George Williams, both of United States Rubber Co., and Harry Temple, Square D Co. The group meets regularly at the Van Orman Hotel on the third Friday of each month.

Bigelow Talks on New Resins

The Cleveland-Akron Section, SPE, held a regular dinner-meeting on February 25 at the Cleveland Club, Tudor Arms Hotel. Approximately 30 members and guests heard Maurice H. Bigelow, technical director, Plaskon Division, Libbey-Owens-Ford Glass Co., speak on "The New Resins."

Dr. Bigelow discussed the German plastics and chemical industries as he saw them immediately following the war. Using slides to illustrate his talk, the speaker described the basic importance of acetylene in the German synthetics industry. This acetylene was produced very economically from natural gas and used under high pressure in many syntheses, a practice contrary to safety regulations in most countries. The information obtained in Germany after the war has had a drastic effect on the soap and synthetic detergent industry in this country. Dr. Bigelow pointed out the potential effects of acetylene chemistry on our entire chemical industry and stated that some of the basic work here is only just getting under way at present.

During the business session it was announced that the Section is holding a membership contest for the period February 26 to June 24. All members, other than directors and committee chairmen, are eligible, and awards will be given to those persons bringing in the most new members.

Burns Speaks Before Philadelphia Section

The February 15 dinner-meeting of the Philadelphia Section was held at the Franklin Institute, Philadelphia, Pa. About 40 members and guests heard Robert Burns, head of plastics engineering, Bell Telephone Laboratories, speak on plastics from the viewpoint of a large consumer of plastic materials.

Mr. Burns stated that price considerations are often over-emphasized; the physical requirements of the part are more important than material cost factors. The principal properties of plastic materials of interest to Bell are dimensional stability, impact strength, and heat resistance. The meeting concluded with the usual discussion period following the talk.

Ferriot Speaker before Central Ohio Section

The Central Ohio Section held a regular dinner-meeting March 10 at the Hotel Berwick, Cambridge, O. Speaker of the evening was J. V. Ferriot, vice president of Ferriot Bros., Inc., who discussed the techniques involved in pressure casting molds from Tombasil and beryllium copper alloys. Molds made from these materials give fine detail and nearly perfect reproduction in molded items. As such, these molds are particularly suited for producing rubber and plastic dolls and fine decorative items. With proper handling the life of these alloy molds is equal to that of steel molds, the speaker said.

Plexiglas in Architecture

Approximately 33 members and guests of the South Texas Section attended a dinner-meeting on March 16 at Felix Mexican Restaurant, Houston. Featured speaker was W. T. Reedy, Rohm & Haas Co., who discussed "New Architectural Uses for Plexiglas."

Mr. Reedy stated that three major markets for acrylics have been developed since the war: display signs, lighting fixtures, and architectural forms. Slides showing applications of acrylics in store fronts, edge-lit murals, etc., were viewed and the speaker discussed the methods used in fabricating Plexiglas for applications in these three fields.

Nickols Favors Beryllium Copper Molds

The Rochester Section held a regular dinner-meeting on March 15 at the Elks Club, Rochester, N. Y., with some 39 members and guests attending. Principal speaker at the technical session was M. H. Nickols, president of Manco Products, Inc., who discussed "Tru-Cast Beryllium Copper Molds."

Mr. Nickols traced the development of beryllium copper alloy and described the properties of this metal which possesses high tensile strength and good machinability. The methods of casting molds were discussed with emphasis on the high-pressure casting method. Properties of the finished molds include excellent reproduction of surface finishes; lack of necessity of finishing operations; ability to produce irregular parting lines; high thermal conductivity; and long service life as compared with other types of molds.

Besides the featured talk, thumbnail sketches were given by members Herschel L. Henry, Tri-Line Corp., Vernon M. Howe, Eastman Kodak Co., and Henry J. Kauth, Kauth-Hardy Co. A 20-minute film on the Rockford Hy-Jector was also shown by Earl Johnson and Frank Morris, of Rockford Machine Tool Co.

Officers of the Rochester Section follow: president, Vernon E. Whitman, Graflex, Inc.; vice president, George A. Peck, Stromberg-Carlson Co.; secretary, Arthur F. Pundt, Eastman Kodak; and treasurer, Richard L. Hayes, Ontario Plastics, Inc.

CALENDAR

Apr.	19.	Philadelphia Section, SPE.
Apr.	19.	Rochester Section, SPE.
Apr.	20.	South Texas Section, SPE.
Apr.	22.	Buffalo Section, SPE Westbrook Hotel, Buffalo, N. Y.
Apr.	26.	Washington Rubber Group.
Apr.	29.	Cleveland Section, SPE.
May	3.	The Los Angeles Rubber Group, Inc. Hotel Mayfair, Los Angeles, Calif.
May	6.	Buffalo Rubber Gorup. Joint Meeting with Ontario Rubber Section, C.I.C. General Brock Hotel, Niagara Falls, Ont., Canada.
May	6.	Detroit Rubber & Plastics Group. Detroit Leland Hotel, Detroit, Mich.
May	9.	Upper Midwest Section SPE. University of Minnesota, Minneapolis, Minn.
May	10-13.	American Management Association, National Packaging Exposition and Conference on Packaging, Packing and Shipping. Municipal Auditorium, Atlantic City, N. J.
May	18.	South Texas Section, SPE.
May	20.	Chicago Rubber Group. Hotel Morrison, Chicago, Ill.
May	20.	Northern Indiana Section, SPE. Van Orman Hotel, Ft. Wayne, Ind.
May	23-25.	Division of Rubber Chemistry, A. C. S. Hotel Statler, Boston, Mass.
May	24.	Washington Rubber Group.
June	7.	The Los Angeles Rubber Group, Inc. Hotel Mayfair, Los Angeles, Calif.
June	10.	Rubber Division, C.I.C. Regional Conference. Royal Connaught Hotel, Hamilton, Ont., Canada.
June	13.	Upper Midwest Section, SPE. University of Minnesota, Minneapolis, Minn.
June	15.	South Texas Section, SPE.
June	16.	New York Rubber Group. Annual Outing. Doerr's Grove, Milburn, N. J.
June	17.	Akron Rubber Group. Summer Outing.
June	17.	Northern Indiana Section, SPE. Van Orman Hotel, Ft. Wayne, Ind.
June	24.	Boston Rubber Group. Summer Outing. United Shoe Country Club, Beverly, Mass.
June 27-July	1.	ASTM. Fifty-Second Annual Meeting. Chalfonte-Haddon Hall, Atlantic City, N. J.
July	30.	Buffalo Rubber Group. Summer Outing. Lancaster Country Club.

New Auto Top Fabric

CORDOGLAS, a new top fabric for recovering convertible automobiles, has been developed by Cordo Chemical Corp., Norwalk, Conn. Made of Bakelite Corp.'s Vinylite resins fused to Fiberglas cloth, the material, it is claimed, has maximum strength, will not stretch or shrink, and is resistant to wearing stress, weathering, mildew, fire, oils, greases, and other elements causing deterioration of ordinary top fabrics. Since it is non-absorbent, Cordoglas can be washed together with the car, and stains can be removed with soap and a damp cloth. Where a burning cigarette discolors the surface of the fabric, it can be retouched with a Vinylite resin

(*Continued on page* 114)

Scientific and Technical Activities

Aging Symposium and ASTM Committee D-11 Chicago Meeting

THE feature of the spring meeting of the American Society for Testing Materials, held at the Edgewater Beach Hotel, Chicago, Ill., during the week of February 28, was a symposium on aging of rubbers, sponsored by Committee D-11 on Rubber and Rubber-Like Materials. The symposium was planned and arranged for by a committee headed by G. C. Maassen, R. T. Vanderbilt & Co., Inc., as technical chairman. Mr. Maassen presided over this event, which was presented on the afternoon of March 2, with about 350 members and guests in attendance.

Simon Collier, Johns-Manville Corp., chairman of Committee D-11, opened the symposium by introducing the president of the Society, R. L. Templin, Aluminum Corp. of America. Mr. Templin described briefly the origin and history of Committee D-11 and paid tribute to its contribution to the work of ASTM and industry in the specification field.

Abstracts of Papers

Abstracts of the six papers presented at the symposium on aging of rubbers, together with the names of the authors and their affiliations are given below:

Mode of Attack of Oxygen on Rubber. It has long been recognized that rubber, because of its unsaturation, is degraded by atmospheric oxygen, and, in contrast with most unsaturated materials, a very small degree of oxidation is sufficient to destroy rubber's characteristic properties. The oxidation of rubber, whether vulcanized or unvulcanized, is a complicated process, involving several reactions, each of which is influenced differently by conditions. The existence of more than one reaction is illustrated by reference to the influence of: (1) a given material on raw and vulcanized rubber; (2) chemicals on mill breakdown; (3) different antioxidants in an otherwise similar stock; (4) combinations of metal catalysts; (5) oxygen pressure on the temperature coefficient of the oxidation; (6) temperature on the amount of oxygen required for degradation; and (7) different aging conditions. A. M. Neal and J. R. Vincent, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Oxygen Absorption Methods—Their Utility and Limitation in the Study of Aging. The three methods commonly employed for oxygen absorption studies (namely, gravimetric, manometric, and volumetric) are briefly reviewed and compared. Illustrative examples of the use of the volumetric method for the study of aging are presented.

The limitations of the method are said to be more numerous or serious than those of other aging tests. The data are shown to be reproducible and to correlate with changes on physical properties. It is recommended, however, that the data be used in conjunction with other aging tests and not as the only criteria of aging resistance.

Oxygen absorption methods are said to offer great promise for continued use in the study of aging and also for possible use as a test for predicting the probable relative resistance to aging in service. The need of further study to establish more precisely the degree of utility and the limitations of the method for such purposes is recognized. J. Reid Shelton, Case Institute of Technology, Cleveland, O.

Chemical Changes in Elastomers and Antioxidants during Aging. While the marked changes in physical properties of elastomers which occur during aging are well recognized, until recently very little was known concerning the nature of the chemical changes. The object of this paper is to review the present status of knowledge concerning chemical changes which occur in elastomers and antioxidants during thermal and photochemical oxidation.

Since definite conclusions are difficult or impossible to obtain by direct experimentation with polymers, indirect methods involving study of low molecular weight hydrocarbons are often used. The best approach to the problem appears to involve investigation of the oxidation products of low molecular weight olefins closely related to the polymer in chemical structure. Beginning with a simple olefin, the effect on the nature of the oxidation products that results from increases in the size and complexity of the molecule is determined. On the basis of such data and reasoning by analogy the reactions most likely to occur in the polymer are deduced. This method of approach is illustrated by reviewing the work of Farmer and his coworkers on the oxidation of cyclohexene, methyl cyclohexene, methyl oleate, low molecular weight polyisoprenes of the type $H\ (CH_2\text{-}C.CH_3{=}CH\text{-}CH_2)_n\ H$, where $n=$ 2,3 and 6, and on unvulcanized natural rubber.

Of the experimental methods applicable to direct study of polymer oxidation products infrared methods are among the most promising. The infrared absorption spectra of elastomers undergo marked changes as the result of oxidation. The interpretation of these changes is discussed, and it is shown that C=O, O—H, and C—O groups are formed as the result of oxidation. The gradual saturation of double bonds is also shown.

Antioxidant consumption during natural and artificial aging is demonstrated by analytical methods. With aromatic amines the secondary amine group is destroyed during aging, and part of the antioxidant appears to combine with the polymer. John O. Cole, Goodyear Tire & Rubber Co., Akron, O.

The Physical Aspects of the Aging of Rubbers. Within the past ten years the general trends of theory and experimental evidence suggest that aging or degradation is quite like polymerization in nature. These reactions are chain mechanisms; the physical changes of which are the net sum of several simultaneous processes; (a) cross-linking, cyclization, and continued polymerization which hardens and stiffens the rubbers, and (b) scission which produces tackiness in the rubbers and results in loss of tensile strength. The relative degree to which different rubbers are susceptible to these mechanisms is discussed.

Several physical methods are available for isolating and measuring the relative rate of one or both of the cross-linking and scission reactions. Among these the use of viscosity, sol-gel relationships, stress relaxation, creep and permanent set methods for measuring the oxidation effects in various rubbers are described and interpreted. M. C. Throdahl, Monsanto Chemical Co., Akron.

Aging Effect of Light and Ozone on Rubber. The action of light and ozone on rubber is manifested in a variety of ways. Light can depolymerize rubber; it can bring about its vulcanization either in the presence or absence of vulcanizing agents; and it can catalyze the oxidation of both raw and vulcanized rubber. The activation of the oxidation of unvulcanized raw rubber by light is susceptible to catalysis, both positive and negative, by various organic chemicals. The action of these chemicals bears little relation to and may be opposite from the effect of these materials on the oxidation of vulcanized rubber in the dark. Light-catalyzed oxidation is largely a surface effect in contrast to that in standard accelerated oxidation tests which are largely a bulk affair.

The cracking of statically and dynamically stressed rubber seems to be due not to the direct action of light, but to dilute ozone generated in the atmosphere by sunlight. The cracking of rubber in light is, therefore, closely related to the cracking of stressed rubber in dilute ozone, and the mechanism of each is probably identical with that of cracking in concentrated ozone.

Frosting and atmospheric and dilute ozone cracking can be controlled by various organic chemicals or suitable protective coatings. On the other hand these devices do not stop the cracking of rubber in more concentrated ozone. Protection in this case is obtained by developing rubber compounds which relax physically after stretching or by producing rubberlike materials which have no chemical double-bonds to react with ozone. The cutting of stressed rubber by electrical discharge can be due to ozone generated thereby, and, in addition, perhaps may be caused by electron bombardment. John T. Blake, Simplex Wire & Cable Co., Cambridge, Mass.

The Effect of Temperature on the Air Aging of Rubber Vulcanizates. The purpose of this report is to show the effect of the temperature of exposure in an air aging test on the rate of deterioration of the properties of typical vulcanizates of natural rubber, GR-S, neoprene, and nitrile rubber.

The results show that over the temperature range of 70 to 125° C. the rate of deterioration is dependent on temperature, and the temperature coefficient of aging varies between 1.82 and 2.87 per 10° C., depending on the composition of the material and the property being measured.

The nature of deterioration in all materials tested is the same over this temperature range except for those materials which develop a non-homogeneous cross-section during aging. Above 125° C. all the materials tested appeared to undergo a different kind of deterioration.

The test tube method of air aging was found to be approximately equal in severity to the oven method and appreciably more reproducible between laboratories. M. J. Schoch, Jr., Hewitt-Robins, Inc., Buffalo, N. Y., and A. E. Juve, B. F. Goodrich Research Center, Brecksville, O.

Considerable discussion from the au-

dience followed the presentation of these papers. It was announced that the Society expected to publish all of the papers and the discussion in the form of a pamphlet within the next three months, if possible.

The Meetings of D-11 and Subcommittees

Meetings of 17 D-11 subcommittees took place March 3 and 4, following the symposium on aging of rubbers; a meeting of the D-11 advisory committee and subcommittee chairmen was held on March 3, and the meeting of Committee D-11, on March 4. The joint SAE-ASTM Technical Committee on Automotive Rubber met March 1 and 2.

Another feature of recent meetings of Committee D-11, the "D-11 Luncheon," took place March 3. This affair was arranged for by a committee consisting of R. M. Howlett, Enjay Co., Inc.; J. Breckley, Titanium Pigment Corp.; T. A. Builifant, Barrett Division, Allied Chemical & Dye Corp.; and Mr. Maassen. Attendance at the luncheon numbered 85 members and guests, and it was mentioned that this event was now a regular part of D-11 meetings. No formal talks were made at the luncheon, but Mr. Collier did inform the members of the new honor recently received by A. W. Carpenter, B. F. Goodrich Co., secretary of D-11, in the form of a Distinguished Service Award from the National Security Resources Board, following Mr. Carpenter's four-month service with that agency as assistant director of the planning division, just completed.

At the meeting of Committee D-11 on March 4, Mr. Collier first thanked Mr. Maassen and his committee for their part in arranging the very successful symposium on the aging of rubbers. The chairman also thanked Mr. Howlett and his committee for planning the luncheon on March 3.

Tribute was then paid to J. L. McCloud, Ford Motor Co., and G. H. Swart, General Tire & Rubber Co., the retiring chairman and secretary, respectively, of Technical Committee A, for their work with that committee. New officers of Technical Committee A were announced as follows: chairman, S. R. Doner, Manhattan Rubber Division, Raybestos-Manhattan, Inc.; vice chairman, H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Corp.; and secretary, W. Davies, Kaiser-Frazer Corp.

H. G. Bimmerman, du Pont, who represented ASTM Committee D-11 at the meeting of the International Organization for Standardization, I.S.O. Technical Committee 45—Rubber, held in London, England, on June 28 and 29, 1948, next made his report. Delegates were present from Australia, France, Italy, Netherlands, Poland, Switzerland, United Kingdom, and the United States.

The agenda covered hardness, tension, stress-strain, abrasion, and tear resistance testing, and details of the meeting are given in I.S.O./T.C.-45 (Secretariat) Report No. 11, Mr. Bimmerman said. Considerable progress was made during the meeting, but more cooperative work will be necessary before complete testing specifications can be drawn up. Hardness tests, as usual, offered many problems, and recommendations with regard to the indentor and time of application of load were made. Agreement was reached on several factors important in stress-strain testing. The United Kingdom was asked to prepare a program of further cooperative work.

The complexity of abrasion testing was discussed, and it was recommended that the principles of the du Pont machine be adopted. The United Kingdom agreed to investigate the effect of modifying the principles of the du Pont machine and to arrange a series of coordinated tests.

Tear resistance testing was dealt with in considerable detail, and the difference between tear initiation and propagation pointed out. It was agreed that the Netherlands and the United Kingdom would jointly investigate the problem and report at the next meeting. The United States was asked to report on the work carried out by ASTM.

Mr. Bimmerman suggested that a copy of Report No. 11 be furnished to the chairman of ASTM subcommittees 10, 14, and 17 for their information so that they can inform I.S.O.-45 of current ASTM practice and any changes being considered in relation to test methods being studied.

The next meeting of I.S.O.-45 will probably be held in Holland about the middle of 1949, and a desire to hold a future meeting in the United States was reported. Committee D-11 then voted to invite I.S.O. Committee 45 to hold its 1950 meeting in the United States, immediately following the annual ASTM meeting for that year.

Mr. Collier next asked R. T. Tener, National Bureau of Standards, to discuss his work for the Federal Specifications Board in revising Federal Specification ZZ R-601A. Dr. Tener stated that this work was about two-thirds completed and thanked the members of D-11 for their cooperation and requested that this cooperation be continued in view of his expectation that the complete revision could then be accomplished within the near future.

A. E. Juve reported on the status of the project being worked on with the National Bureau of Standards for the preparation of standard samples of rubber compounds for use in industry standardization and testing. The number of standard compounds has been reduced from 15 to 13, but the evaluation of test results being carried out on these compounds is not available as yet. Seven standard compounding ingredients, however, are now obtainable from the Bureau of Standards.

Because of the increasingly greater amounts of work being planned in the field of determining the properties of high polymeric materials at low temperatures, D-11 recommended that ASTM Committee E-1 appoint a subcommittee to coordinate programs now under way or about to begin in D-11, D-20, and elsewhere.

Changes in personnel with respect to chairmen of D-11 subcommittees and D-11 representation on other ASTM and ASA committees were announced as follows: R. H. Titley, Public Service Corp. of N. J., to represent D-11 on Committee D-9; Mr. Schoch, Jr., to become chairman of D-11 subcommittee 2 on belting; Mr. Titley to replace John Ingmanson, Whitney Blake Co., on ASA Committee C-59, and Mr. Blake to take the place on ASA Committee C-8 formerly held by the late J. R. Becker, Westinghouse Electric Corp.; Rolla Taylor, United States Department of Agriculture, to become chairman of D-11 subcommittee 26; Dr. Tener to become chairman of D-11 subcommittee 14; and W. P. Tyler, Goodrich Research Center, to represent D-11 on Committee E-1, technical committee 7.

It was voted to bring the bibliography on rubber testing up to date and to include it again in the "ASTM Book of Standards on Rubber Products," a practice discontinued in 1943. It was also voted to establish an editorial subcommittee to carry out this work and also to assist in the editorial revision of any D-11 Standards, as required.

A moment of silence was spent by the members of D-11 as a tribute to four associates, J. R. Becker; R. E. Moore, National Electric Products Co.; H. H. Craver, Pittsburgh Testing Laboratories; and E. R. Dillahay, The Richardson Co.; whose deaths occurred during the past year.

The reports of the various subcommittee chairmen were next heard, and a brief summary of these reports, which indicate the actions taken or about to be taken in the various fields, follows:

SUB. 1—HOSE, L. Cranston, United States Rubber Co., chairman. The method, D-380, for measuring the outside diameter of rubber hose of a diameter of less than one inch, has been revised to specify the use of steel calipers graduated in 64th's of an inch and is being submitted for letter ballot. The length of the sample of hose less than three inches in inside diameter to be taken for the bursting test has been changed from 18 to 36 inches. The technique for the immersion tests for swell and deterioration of hose used for petroleum products has been revised and is also being submitted for letter ballot. D-296 Fire Hose Specification is not in agreement with the latest specification of the Underwriters Laboratories and therefore is being revised and submitted for letter ballot.

SUB. 3—THREAD, RUBBER, J. J. Allen, Firestone Tire & Rubber Co., chairman. Following the results of round-robin tests of cut and extruded rubber thread according to existing methods in industry, tentative specifications for size, yards per pound, tension and recovery, modulus, permanent set, etc., will be written by May for submission at the June meeting.

SUB. 5—INSULATED WIRE AND CABLE, John Blake, chairman. It was voted to add three I.P.C.E.A. methods for the determination of moisture absorption of insulation to be used in wet locations to the existing method in D-470. It was also voted to include the method of testing for tear resistance now in D-532 in D-470. Specification limits, however, are not to be included in D-470. The definition and specifications for the oil used in the immersion tests in D-752 and D-753 are to be changed to those for ASTM #2 oil. The electronic method of determining ozone resistance is to be added to the chemical method in D-470. All of these changes are to be submitted for letter ballot. The feasibility of writing specifications for insulation made with polyethylene and silastic are to be reviewed.

SUB. 6.—PACKINGS, F. C. Thorn, Garlock Packing Co., chairman. A short paper on creep and relaxation in compressed asbestos gaskets was read by the chairman. A section was set up to review work on creep and relaxation in gaskets. Methods for testing the corrosion of compressed asbestos sheet, when used against metal, is being worked on, but not much evidence of corrosion has been found in tests made to date. It is planned to increase the severity of the test. Technical Committee A has been developing specifications for compressed asbestos for automotive use. A section was established to review this work with the idea of writing a specification for this material for general applications. The Navy seal aging test for gaskets is being studied for adoption.

SUB. 7—RUBBER LATICES, G. H. Barnes, Goodyear, chairman. Work on "Proposed Specifications and Methods of Test for Concentrated, Ammonia Preserved, Creamed and Centrifuged Natural Rubber Latex" has been completed and the speci-

fications are being submitted for publication as information by the ASTM. The specifications are also being submitted to The Rubber Manufacturers Association, Inc., for possible adoption by that organization. No further work on specifications is contemplated, and future efforts will be directed toward improvements in methods of testing.

SUB. 10—PHYSICAL TESTS, L. V. Cooper, Firestone, chairman. The section on the revision of procedures for D-412 and D-15 submitted its report, but because of time, only the revision of D-412 was reviewed in detail. Both specifications will be circulated for letter ballot. The section on the development of methods of test for the coefficient of friction made its report and indicated its plans for future work.

SUB. 11—CHEMICAL ANALYSIS, W. P. Tyler, chairman. No meeting of the subcommittee was held, but the chairman reported progress on the work being done in cooperation with the Federal Specifications Board and stated that D-297 would be revised by June.

SUB. 14—ABRASION TESTS, Rolla Taylor, chairman. A report by A. E. Juve and R. A. Shearer, Goodrich Research Center, on specimens for testing tear resistance was presented. It was recommended that the Graves die be used wherever practicable. G. Reinsmith, Ordnance Department, U. S. Army, reported on the work being done by that organization in surveying existing methods for testing resistance to tear. Abrasion test results were received from S. H. Tinsley, Vanderbilt, chairman of subcommittee 24 on coated fabrics, and Mr. Juve reported on plans for studying the effect of temperature on the abrasion of tires.

SUB. 15—LIFE TESTS, G. C. Maassen, chairman. Section 1 on the aging of vinyl plastics reported no progress. Program requires revision to include vinyl sheeting and molded items in addition to wire and cable. The coordination of future work with that being done by Committee D-20 and the SPI was recommended. R. A. Schatzel, Rome Cable Corp., reported on the Henley oven for air aging work. This oven, designed and built in England, can be duplicated in this country for about $1,100. Temperature uniformity within this oven is said to be very good, but the need of higher maximum temperatures in the neighborhood of 150°C. was discussed. Section 2 on artificial *versus* natural aging referred to the paper given by Mr. Juve at the symposium as its progress report. Section 3 on ozone aging stated that the wide variation in results obtained in first round-robin tests has been decreased following a discussion with J. Crabtree, of Bell Telephone Laboratories. Section 4 on miscellaneous properties reviewed the government sponsored work on oxygen absorption which involves the building of absorption apparatus and tests to be conducted with the various synthetic and natural rubbers. Section 6 reported that the revision of D-454, D-572, and D-865, with regarding to heating methods, had been completed and was being submitted for letter ballot.

SUB. 17—HARDNESS, SET AND CREEP, Mr. Doner, chairman. Changes in the method of calibration of hardness testing instruments (Shore, Rex) are to be submitted to letter ballot. The section on creep and low temperature set will become more active.

SUB. 18—FLEXING TESTS, B. S. Garvey, Jr., Sharples Chemicals, Inc., chairman. A report and a proposed method of test using the Ross-Emerson flex tester was submitted by Mr. Builifant and recommended for letter ballot. Suggested changes in D-430 in connection with the use of the Scott, du Pont, and De Mattia flexing machines were presented. The subcommittee recommended that the D-430 Standard be revised, as suggested, and that the method be separated into three methods. A section was appointed to investigate changes in the method using the Goodrich flexometer, D-623A.

SUB. 19—IMMERSION TESTS, Mr. Howlett, chairman. ASTM oil #2, according to Society specifications, is now available from the Sun Oil Co. instead of the Sun Oil code numbered oil previously offered. Specifications for ASTM reference fuels #1 and #2 are now obsolete and require revision; this revision will be submitted for letter ballot. Developments of new gasoline-type reference fuels by the Army Air Force will be reviewed by the subcommittee, but adoption of these new refernce fuels as ASTM Standards is not contemplated at this time.

SUB. 21—CEMENTS, J. F. Anderson, B. F. Goodrich Co., chairman. D-553 and D-816 were discussed, and suggestions of the Army Ordnance in connection with these specifications were considered desirable. New resins and rubbers being used in cements will be discussed with industry, and test methods for new synthetic adhesives investigated.

SUB. 22—CELLULAR RUBBERS, Mr. Bimmerman, chairman. Separate specifications and test methods for chemically blown sponge and latex foam rubber are being submitted for letter ballot before the June meeting. This change will mean a combination of D-552 and D-798 for each of these two types of cellular rubbers and the assignment of new ASTM numbers.

SUB. 23—HARD RUBBER, H. J. Flikkie, Goodrich, chairman. The section on physical testing reported progress with its round-robin testing program, and a special meeting is planned at an early date. D-639 is to be rewritten for clarification, and an impact strength test for asphalt composition battery containers is to be investigated.

SUB. 24—COATED FABRICS, Mr. Tinsley, chairman. The Schleffer machine was reported to show the most promise for abrasion testing of coated fabrics, and more work with this machine is planned. A summary of round-robin tests with the Edgewear machine was presented. The use of the Stoll abrader was also considered. New abrasive wheels for the Taber machine also indicate that improved results may be obtainable with this machine.

SUB. 25—LOW TEMPERATURE TESTS, R. S. Havenhill, St. Joseph Lead Co., chairman. The Gehman stiffness tester was recommended for use in low temperature testing as a tentative standard. The Thiokol bent loop test, D-736, is to be discontinued as tentative standard. Brittleness tests, where required, are now to be made according to D-746. Natural rubber tread stocks are to be tested by the forced vibration method at temperatures between 0 and 122° F.

SUB. 27—RESILIENCE TESTS, E. G. Kimmich, Goodyear, chairman. The method of test using the Goodyear-Healy rebound pendulum is to be submitted to letter ballot. The section investigating forced vibration methods does not have a testing program started as yet, but expects to begin this work in the near future. Further work on the torsional pendulum method will be discontinued because of lack of interest in this type of test.

TECHNICAL COMMITTEE A—Mr. Doner, chairman. The section on coolant hose will investigate the problems involved in new anti-freeze solutions now on the market. A new specification on hydraulic window-lift hose is being written by the section on fuel and oil line hose. A new specification for air brake hose is awaiting approval by SAE. The section on automotive rubber compounds reported that the revision of the tables of compounds in D-735 had now been completed and was being submitted for letter ballot. The RN and RS specifications have now been combined in a single R table, and specifications for resilience added. Butyl rubber is included in the R table at present. A new table to cover compounds made with silicone-type rubbers is planned. A method for determination of discoloration and staining by light using both the S-1 and RS-type bulbs has been written and is being submitted for letter ballot. Temperature limits for migration and stain testing are to be more accurately determined.

It was reported that the round-robin test of aging at high temperatures is 80% completed. The round-robin test of ozone aging is in progress, but difficulty with the determination of end points was mentioned.

Testing for oil resistance as regards oils and methods, testing for tear resistance, and testing at low temperatures are being investigated with various D-11 subcommittees.

New specifications have been written for the coding of molded and extruded automotive rubber parts and will be submitted for letter ballot. This specification includes the provision that the RMA assume the responsibility for the assignment of code numbers to manufacturers in place of Technical Committee A.

A new V-belt specification is awaiting approval by SAE. A meeting will be held in Detroit at an early date to consider V-belt "noises" and to discuss further standardization of testing procedures.

New specifications for bus and truck brake cups were completed in December, 1948, and specifications for asbestos gaskets are about finished.

Technical Committee A will hold its next meeting in Detroit, Mich., the second week in June, it was decided.

The next meeting of D-11 will be at Atlantic City, N. J., during the week of June 27 as part of the annual meeting of the parent Society. Chalfonte-Haddon Hall Hotel will be headquarters for Committee D-11.

Good-rite Plasticizer

GP 261, the first Good-rite plasticizer to be marketed by B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15, O., has been announced by J. R. Hoover, company vice president-sales. A dioctyl phthalate plasticizer, the new product is said to be excellent for vinyl and other synthetic resins as well as for nitrile type rubber. GP 261 imparts such desirable properties as heat and light stability, permanent flexibility, low temperature flexibility, resistance to hydrolysis, low water extraction, and excellent electrical properties.

Properties of GP 261 follow: odor, moderate and characteristic; specific gravity, 0.986; molecular weight, 390; boiling range at four-mm. pressure, 99% between 215 and 250° C.; freezing range, forms stiff gel at —50 to —55° F.; refractive index, 1.485; weight per gallon at 20° C., 8.22 pounds; and hydrolysis, negligible. The plasticizer is practically insoluble in water; completely soluble in gasoline, benzene, mineral oil, and toluene; and very slightly soluble in glycerine and diethylene glycol.

Akron Group Industrial Fabrics Symposium

THE symposium on industrial fabrics and the panel discussion which featured the February 18 meeting of the Akron Rubber Group attracted an attendance of approximately 500 members and guests to the afternoon meeting, while almost 450 remained for dinner and the demonstration talk by Larry F. Livingston, manager, public relations department, E. I. du Pont de Nemours & Co., Inc. Henry F. Palmer, consultant, chairman of the Group, presided at both sessions and introduced the speakers.

At the afternoon session a paper by Warren F. Busse and Helmut Wakeham, Institute of Textile Technology, Charlottesville, Va., on the subject of "Cotton as a Raw Material for Industrial Fabrics" was first presented by Dr. Wakeham. Dr. Busse, a former member of the Akron Group, was originally scheduled to present this paper, but was prevented from doing so by illness.

The second paper, offered by W. W. Owen, du Pont, was entitled "Synthetic Fibers in Industrial Uses." C. H. Froeling, also of du Pont, originally scheduled to give this paper, asked that Dr. Owen replace him on the program since he, Dr. Froeling, had been transferred to another division of the company.

Both papers were followed by a question and answer period at which questions previously submitted were answered by a panel of experts consisting of E. M. Penny, Owens-Corning Fiberglas Corp.; A. H. Burkholder, Industrial Rayon Corp.; R. W. Elder, National Standard Co.; H. S. Grew, Jr., Wellington Sears Co.; H. B. Shearer and A. B. Baker, both of the American Viscose Corp; and Drs. Wakeham and Owen.

The Afternoon Program

Dr. Wakeham first reviewed the factors, such as availability, cost, and quality, responsible for the dominant position in the field of industrial fabrics held by cotton in the past. Under quality came a discussion of strength, flexibility, and abrasion resistance. Current improvements in cotton quality through research and development work were discused with special reference to change of twists and some form of pulldown or tension to reduce elongation of tire cord before it was used in a tire, and the treatment of cotton fibers with resins to improve strength. In conclusion, Dr. Wakeham stated that the cotton industry no longer thinks that cotton has to be used because it always has been used and, consequently, does not require improvement. Research in all phases of cotton production and utilization has already resulted in better-quality cotton at reduced cost, and the failure or success of such work will probably have a great influence on the future market for this fiber. This paper will be published in a future issue of India Rubber World.

Dr. Owen, in discussing synthetic fibers, stated that since production of viscose rayon was begun in 1910, production of all types of rayon increased almost without interruption to a total of 1,124,300,000 pounds in 1948, of which about 250,000,000 pounds of high-tenacity viscose yarn were consumed by the rubber industry. Following the introduction of nylon in 1938, several new synthetic fibers have appeared including Vinyon and Vinyon N from vinyl resins; Saran, Velon, and Viskord from vinylidene chloride; and recently "Orlon" acrylic fiber. Several protein-base fibers in the form of staple also have been announced. Of all of these fibers, only viscose rayon and nylon are used to any extent as reinforcing materials in rubber goods.

The increase in consumption of high-tenacity viscose yarn by the rubber industry within the past few years has been due to its ability to do a better job or to perform equally well at lower cost or, in many instances, to do a better job at lower cost than previously used materials. The advantages of rayon are high strength per unit weight at normal and elevated temperatures, low gage per unit of strength, high yardage per pound, uniform properties, and relatively stable price level.

These properties of high tenacity rayon are utilized in making stronger, thinner carcass tires that operate with lower temperature differentials; longer life V-belts; and woven, knitted, and braided rubber hose of lighter weight or higher bursting pressures. Fabrics woven from this type of yarn having strengths up to 900 pounds per inch are used in wrapped hose, diaphragms, conveyer belts, and flat transmission belts, Dr. Owen said. Normal-strength textile viscose rayon proved to be outstanding as a reinforcing material for bicycle tires.

Nylon has been used for several years in military plane tires because of its ability to withstand the shock load of landing and its very high strength per unit weight. These properties together with the high fatigue resistance of rayon have resulted in its utilization in postwar premium passenger-car tires and in truck tires for selected or critical service. Because of its low moisture regain and resistance to shock loading, nylon is used in V-belts for farm machinery and drilling rigs. It is also used in fabrics for conveyer belts, diaphragms, de-icing equipment and wing linings for airplanes, and for curing tapes.

The day of a universal fiber for the wide ramifications of the rubber industry is past, Dr. Owen said in conclusion. As old fibers are improved and new fibers developed, they will be used for specific applications determined by the balance between the economics and the characteristics of the individual fibers.

The Evening Meeting

The demonstration talk by Dr. Livingston, showing developments of modern industrial chemistry, was the feature of the evening meeting. Illustrated by numerous products using du Pont materials such as polyethylene, Lucite, neoprene, and nylon and presented in a most entertaining manner, the talk was received with enthusiasm by the audience.

At a short business meeting immediately following dinner Dr. Palmer called for the report of the nominating committee headed by E. Busenberg, The B. F. Goodrich Co. Nominated for chairman was C. A. Ritchie, Goodrich; for vice chairman, E. L. Stangor, du Pont, and A. W. Oakleaf, Phillips Chemical Co.; and for secretary-treasurer, Dale F. Behney, Goodyear Tire & Rubber Co., and C. G. Cashion, Xylos Rubber Co.

F. W. Stavely, Firestone Tire & Rubber Co., vice chairman of the Division of Rubber Chemistry A. C. S., and chairman of the Division's liaison committee for local rubber group contacts reported on the make-up of his committee as follows: J. H. Ingmanson, Whitney Blake Co., Hamden, Conn.; D. D. Wright, Hood Rubber Co., Watertown, Mass.; H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Corp., Chicago, Ill.; and D. C. Maddy Harwick Standard Chemical Co., Los Angeles, Calif.

E. Krismann, du Pont, spoke briefly on the plans for the meeting of the Rubber Division to be held at the Hotel Statler in Boston, Mass., May 23-25. These details were reported on page 738 of our March issue.

Dr. Palmer reported that the officers of the Akron Group had decided against incorporation at this time. It has been decided, however, to institute a membership fee of $1 a year.

The next meeting of the Group will be held on April 15, at the Mayflower Hotel, at which time R. Houwink, director of the Dutch Rubber Research Institute, Delft, Holland, will speak on "Rubber in Road Construction." Warren S. Lockwood may also talk at this meeting on the conditions he found in the European rubber industry during a recent trip abroad.

The Panel Discussion

A record of the question and answer period which followed these papers on synthetic fibers and on cotton are given below:

Q. What is the cotton textile industry doing to meet the challenge of synthetic fiber developments?

A. (*Mr. Grew.*) In the apparel or consumer goods fields the textile industry has converted many cotton mills from cotton to synthetic fibers, and new mills have been built, and are still being built, expressly for the purpose of producing synthetic yarn fabrics. In the field of industrial fabrics the textile industry has been criticized for its slowness in developing synthetic yarn fabrics. Lack of ability to obtain raw materials for these end-uses and the time required to obtain approval from the customer (six months to 2½ years) are the major causes of delay rather than lack of enthusiasm on the part of the textile industry.

Q. How does the government support program maintain the high price of cotton?

A. (*Dr. Wakeham.*) The government support program is an attempt to assure the cotton farmer a price for his cotton that will be proportional to the prices he has to pay for what he buys. The cotton price for a given period is based on a "parity price," which is the price of cotton averaged over the period 1910 to 1914, multiplied by the index of prices paid for other goods the farmer buys. The government accomplishes price support for cotton by lending the farmer money against his cotton crop at a rate based on 92½% of the parity price. If the farmer can sell his cotton for a price higher than that based on the loan, he may repay the government loan and pocket the difference. If he can't sell his cotton for the higher price, he turns it over to the government instead of repaying the loan. The government can do one of two things: sell at a loss (I can assure you that is what happens much of the time), or hold the cotton until it can be sold at a profit. Under the present plan the farmer shares in this profit.

The maintenance of a higher price for cotton, however, hurts the cotton farmer by stimulating the production and use of competitive fibers. The new Aiken Formula, scheduled to be effective in 1950, establishes cotton prices that are not based only on the parity price, but on a gradually decreasing percentage of the parity price. The new 1949 support price is fixed at 90% of parity. Some legislators are attempting to reduce the "percent of parity" price until the price of cotton will be determined by the law of supply and demand rather than by the price support program.

Q. Does the treatment of cotton, in sliver form, with aqueous silica suspensions

or colloidal silica improve its properties for use as tire cord?

A. (*Dr. Wakeham.*) Silica treatment of cotton in sliver form was developed at the University of Texas, and results have been published in the *Textile Research Journal*.[1] It is claimed that the strength of the yarn has been improved, but I have not seen any results which indicate that the strength improvement might be carried over into tire cord.

Q. What fabrics are best for vinyl or pyroxylin coatings, and what adhesives or sizes are best for pretreating the fabric for this type of coating?

A. (*Mr. Grew.*) For pyroxylin coated materials, standard wide drills, broken twills, sateens, and wide sheetings are commonly used. There are differences of opinion as to the fabrics best suited for vinyl coating. The action in coating with vinyl resins follows the "hills and valleys" in a woven fabric; while the action in coating with pyroxylin does not have this difficulty. Developments are on the way that should overcome the present difficulties in coating with vinyl resins, one of which is the use of *non-woven* material. At present, commercially available types have uni-directional strength and tend to separate when processed, but a new non-woven material has just come on the market which has the same strength and tear in all directions and tends to increase the tensile and tear strength for subsequent processing.

To get the best adhesion, especially with vinyls, the fabrics should be desized. Research work is being carried on to develop sizing materials, other than those commonly used, which would be compatible with the resins used by the coaters, thus eliminating the necessity of desizing the cloth. Mention can also again be made to the non-woven fabrics which can be bonded with resins similar to, or at least compatible with, the coating resins to be used.

Q. Does cellulose tend to degrade when curing rubber products containing it at 250 or 300° F.?

A. (*Dr. Wakeham.*) Yes, especially in the presence of moisture and air. In curing a tire no appreciable degradation takes place during the actual cure because at the high temperatures moisture and air are excluded. Work by the du Pont company at Richmond on the degradation of tire yarn both in the presence and the absence of air shows that, in the absence of moisture and air, rayon degraded somewhat more slowly than cotton; and, in the presence of moisture and air, rayon is degraded more rapidly than cotton.

Q. What is being done with the development of rayon fabrics for belting and for hose? Nylon for chafer fabrics? Blends of nylon and cotton for belt covers?

A. (*Mr. Grew.*) High-tenacity rayon fabrics have been developed for use in belts and woven hose and are now out in the field under actual operating conditions. A limited amount of experimental work has been carried on with nylon for chafer fabrics, and blends of nylon and cotton have been tried out for belt covers which, in this case, I assume, refers to covers used on V-belts. The rapidity with which new fabrics can be made available to the rubber industry depends, as already emphasized, on our ability to obtain the necessary raw materials and have them properly evaluated as compared with materials being used today.

Q. Aminizing cotton—that is, treatment with 2-amino ethyl sulfuric acid—permits introduction of metallic elements and various organic groups in the cellulose molecule. Does this procedure hold any promise for use in rubber goods?

A. (*Dr. Wakeham.*) This treatment was developed in the laboratory for the purpose of making a dye-fast cotton fabric. If the things that cause tire cord to lose strength or degrade can be excluded by attaching such compounds to cellulose, then this treatment shows promise for improving the usefulness of cotton for rubber goods.

Q. What fabrics are best suited for shoe fabrics?

A. (*Mr. Grew.*) Fabrics commonly used today in the manufacture of shoes are wide duck, army duck, drills, knitted fabrics, and other specialties. In most cases the economics are the determining factor in the fabrics best suited for shoes. Sneaker-type shoes usually fail because of deterioration from perspiration and because of abrasion. I believe that cooperative work between the textile and the shoe industries could develop fabrics which would be economically sound and which would last much longer if the synthetic fiber selected is inherently resistant to perspiration and abrasion.

Q. Discuss the possibilities of the applications of ramie to the rubber industry.

A. (*Mr. Grew.*) We have done considerable research work with ramie and have found that for industrial fabrics at the present time it is economically unsound, and also, although the yarn itself will prove stronger than an equivalent cotton yarn, we have been unable to carry that strength into the woven fabric. In addition, we have been unable to weave a fabric with sufficient crimp to permit the user then to process it and have any crimp left in the material.

A. (*Mr. Shearer.*) It is our opinion that before ramie can be seriously considered for use with rubber, many changes and improvements in its methods of production, preparation, and processing will have to be made. These changes do not seem to be economically or physically feasible of accomplishment so as to offer serious competition to synthetics as now produced or as they may be produced in the future. Slight differences in the weather, method and age of harvesting, or methods of decorticating and degumming, each will materially affect the quality of the fiber, and these conditions are difficult to control. Equipment for decorticating and methods of degumming are yet to be perfected.

At present the raw undegummed fiber costs around 30¢ a pound. Degumming, spinning, and handling costs make this yarn sell for around $2.00 a pound. While the fiber possesses good wet and dry strength, it varies considerably, has a high degree of brittleness, and is non-uniform in diameter and in staple length. These factors make the economical spinning of a yarn of uniform quality with good physical properties, as needed for tires and mechanical rubber goods, seem a very remote possibility.

Q. What is the present-day thinking on the finishes used to improve the processing of rayon filaments, with reference to its fatigue resistance?

A. (*Dr. Owen.*) There is wide disagreement between members of the rubber industry as well as between the various rayon producers, as to the best type of finish for rayon filaments. There is considerable evidence that the oil-type finish has improved fatigue resistance either directly or indirectly. Ultimately both the tire industry and the rayon producers may find and agree on what might be considered a universal finish, but I am afraid that the time is remote.

Q. What has been done to prevent the low wet strength for rayon yarns?

A. (*Mr. Burkholder.*) The reduction in strength of viscose rayon upon wetting has been a matter of concern with respect to clothing long before rayon was used in the manufacture of tire cords. While much is unknown in this regard, two things are fairly well established. High strength rayons have a high wet to dry strength ratio than less highly stretched rayons. This statement means that as a rayon is stretched to increase the dry strength, the wet strength increases to an even greater extent. Many attempts to increase the wet strength by chemical reaction, such as with formaldehyde, have resulted in the reduction of other desirable characteristics such as dry strength and flexibility.

Q. What advantages in quality of rayon are to be had by pot spinning as compared with spool or continuous spinning?

A. (*Mr. Burkholder.*) The question implies that rayon from one type of spinning machinery is inherently superior to that from another for use in tires. The concensus of opinion of the rayon manufacturers is that there are so many other variables in the manufacture of rayon, such as type of spin bath, degree and place of stretching, kind of processing solutions, type of finish, etc., that some of the observations which may have led to the conclusions implied in this question were the result of other factors and the characteristics observed in tire performance could have been coincident with the method of spinning rather than a necessary result of it.

Q. What is the thinking on optimum yarn size of continuous filament rayon with regard to tire performance?

A. (*Mr. Baker.*) We are necessarily guided in our thinking and actions along this line by demand and customer preference. We, as an industry, are now producing at least three different deniers of yarn for the tire trade. Each of these seems to have some degree of support in the rubber industry. During the last few months the volume of 1650 denier has increased approximately 20%. Some of this increased volume has been at the expense of 1100 and 2200 denier; while some represents new production. Indications are that any definite trend is toward 1650 denier. We do not say that 1650 denier is the optimum yarn size, but it is at this time the most popular.

Q. Would you review the thinking relative to dip penetration for good fatigue resistance performance of rayon?

A. (*Dr. Owen.*) Results of laboratory studies combined with experience of the tire industry as a whole have indicated that low penetration of dip is desirable. What we feel is needed is a type of textile structure that can flex and bend with each revolution of a tire. If filaments are cemented together with an adhesive, they are not able to slide on each other as a tire is flexed so that cord will behave more like a monofil than as a supple textile structure. By confining penetration of dip to the outer layer of filaments, which may be three to six filaments deep, depending on the type of adhesive and filament surface condition, there is evidence that better cord structures are obtained. It is known from past experience that a monofilament cord is not a satisfactory structure for the types of flexing that occur in a tire.

Q. Can an adhesive be applied to rayon by the rayon manufacturer to eliminate treatment of the cord by the rubber manufacturer?

A. (*Mr. Burkholder.*) This seems to be a perennial question. I interpret it to mean that the adhesive would be applied to the rayon yarn rather than to the cord so as to get thorough coverage of all of the fila-

[1] 17, 331 (1947).

ments. Adhesives which are effective in fastening materials to rubber are sticky; thus the filaments would stick to each other as well as to the rubber. When yarn so treated is twisted into cord, the required movement of filament over filament would be prevented, and the resulting cord would not have the usual smooth and rounded appearance, but would be rough and irregular as if it were a twisted ribbon.

The various textile operations associated with twisting yarn into cord utilize a number of guides and tensioning devices which require that the yarn be lubricated; wholesale modification of machinery parts would be required to handle a yarn coated with adhesive in place of a lubricant. Application of the adhesive by the rayon manufacturer would require material which could be stored without aging and which would best suit the needs of each consumer. The present dipping units in a tire factory handle fabric containing approximately 2,000 cords which are equivalent to 4,000 ends of yarn. The usual slasher beam holds less than 200 ends of yarn. Thus the present problem of keeping the dipping equipment clean would be multiplied by a factor of 20 or more if the adhesive were applied to the yarn.

Q. What are the prospects for a continuing supply of wood pulp or other raw materials for rayon manufacture? Are the sources adequate for present or possible increased rate of consumption?

A. (*Mr. Shearer.*) The trend is for pulp production to keep pace with rayon production. Rayon production in 1948 has been estimated at 1,100,000,000 pounds. Against this, there was available a new 1948 production of dissolving pulp of some 1,294,200,000 pounds. In the next two years, rayon capacity is not expected to be increased more than 190,000,000 pounds.

To take care of this increase the building of one dissolving pulp plant was initiated in 1948. Plans for the building of two more plants have been announced, and negotiations for two additional ones have been reported. Should just two of these pulp mills be in production in 1951, there will be an additional 250,000,000 to 300,000,000 pounds of dissolving pulp produced at that time. This should more than take care of all prospective requirements of the rayon industry.

Q. What progress is being made in overcoming the fatigue break problem in rayon carcasses? How is any advance being achieved?

A. (*Dr. Owen.*) When the tire industry first began making tires with synthetic rubber, it first tried to make them essentially the same way it did with natural rubber. When government restrictions on rayon were removed and its use was permitted in passenger-car tires, many tire makers, without much background of experience with rayon, immediately started to produce rayon passenger tires with little change in design from that used for cotton tires. As a result, some had rather serious difficulties. I think the experiences we have had during the past several months have indicated quite clearly that no single factor has been responsible for the difficult growing pains the tire industry has been experiencing.

One of the most important problems at the present time is dynamic adhesion. I have observed a large number of so-called fatigue failures which I am certain have been due primarily to lack of adequate bond between rubber stock and cord. Failure of this bond with separation of cord from rubber is believed to permit buckling of filaments within a cord structure under compression, with subsequent rapid cord failure. Different types of adhesive have been used to overcome this trouble in several instances. In other instances the situation has been improved by increasing the twist in both the single and cord structures and by increasing the end count in the cord fabric.

Q. Rayon and cotton cords each have certain inherent weaknesses as tire fabrics. Don't you think the strong points of one could be made to compensate for the weak points of the other in a cord comprising 60% rayon and 40% cotton?

A. (*Mr. Baker.*) We have no definite information on tests along this line. We do know that some tests have been made, but the results have not been made available to us. We have seen on several occasions tires in which the plies were inadvertently mixed. As far as we know, premature failures resulted in every case and showed the breakdown to originate in the odd ply. This was true regardless of which-type yarn appeared in the odd ply. These were load carrying plies, since we know that breaker construction can vary from that of the carcass with no ill effects. Failures of this kind probably develop because of the difference in elongation characteristics of the two yarns which leads to ply separation. We feel that these characteristics vary so much that a deliberate mixture would tend to accentuate rather than compensate the weaknesses of each. At this time we would not recommend the practice of mixing these two fibers either in the cord or in tire building.

Q. How does the performance of wire carcass tires compare with cotton or rayon cord carcasses?

A. (*Mr. Elder.*) Thus far wire tires have been limited in application to bus and truck usage for the most part. Increases of up to 40% in original tread mileages have been observed which are attributable to cooler running characteristics because of better heat dissipation. Inflation pressures are higher, being calculated to allow about 10% maximum deflection rather than the 12% customary with textile cord fabrics. The fact that the strength of the carcass is not deteriorated due to heat generation, also permits many additional retreading operations.

While this question was asked with special reference to tires, I might add that much the same line of reasoning applies to the use of fine wire cable in V-belts, and approximately one half of the present wire cable output is used in V-belt applications.

Q. What are the chances of wire becoming competitive with cotton, rayon, or other synthetic yarns with respect to price?

A. (*Mr. Elder.*) The wire cord tire is still in the development stage; hence volume production has not been achieved in the manufacture of the wire cord. Even during this period of inflated prices, however, a reduction in the price of the wire cord of approximately 40% has been made over the last five years. It is extremely difficult to foresee under present-day conditions a time when wire tires will be competitive with rayon or cotton tires as far as initial cost is concerned. If total mileage by virtue of an increase in the number of possible retreads is considered, the wire cord tire is now competitive or even more economical in specialized applications.

Q. How does the fatigue resistance of wire cord compare with cotton and rayon cords?

A. (*Mr. Elder.*) I do not know of any specific test that would be applicable to tires made with either cotton, rayon, or wire that would provide a definite answer to this question. If viewed from the standpoint of obtaining an answer in terms of an endurance limit expressed in so many thousand pounds per square inch, the wire would probably have the highest value. In a practical test, such as flexing a sidewall section through a given arc over a given radius of curvature, as is used with textile cord tires, the wire would probably give the poorest results. Control of this flexing, of course, is the reason for the higher inflation pressures recommended for wire tires.

Q. What are the potential advantages of glass yarns in tires, belts, hose, etc.?

A. (*Mr. Penney.*) The principal advantages follow: (1) Extremely high strength is available as evidenced by the high strength to weight ratio of the material. (2) The absence of cold flow in the fabric prevents the hose or tire from taking on permanent set with pressure or the V-belt from stretching. (3) The high thermal conductivity of glass permits the heat generated in the structure to be more rapidly dissipated, thus lowering the averaging operating temperature. (4) The resistance of Fiberglas to fungi, moisture, and humidity tends to increase further the life of products in which it is used. (5) The high-strength properties of Fiberglas should permit the manufacture of tires with fewer plies and thus permit a saving in the amount of fabric and rubber used while at the same time improve the flexibility of the tire and its ability to absorb road shocks. We believe that we are making some fundamental advances in the improvement of Fiberglas products and this fact, plus our past experience with the material, is the basis for the statements made.

Q. What success has been made in producing a tire cord from Fiberglas yarns with the twist necessary to obtain high fatigue resistance?

A. (*Mr. Penney.*) In answering this question it is necessary to remember that fatigue resistance, as technically defined, is very high in Fiberglas fibers. We have numerous test results that indicate single glass fibers will sustain indefinitely 75% of their ultimate strengths. These results have also been substantiated by work conducted at Corning Glass Works in evaluating high strength glass rods in test procedures extending over a period of ten years.

What is frequently defined or interpreted as fatigue, when referring to Fiberglas tire cords is, we believe, a matter of fiber to fiber abrasion and/or unequal loading of the individual filaments in the cord due to the relatively low elongation possible with glass filaments, which have a maximum elongation between 3% and 4% before breaking. In contrast to other types of fibers when loaded, individual filaments of glass cord, when slack, bear little or none of the load until the taut filaments have been stretched so far that they break. Under such conditions the potential strength of the combined glass filaments is not realized since breakage is progressive in nature. We have had some measure of success during the past two or three years in improving the fatigue resistance of Fiberglas yarns by coating strands with various types of resins and combining these coated strands into a cord using relatively high twists. One item of particular interest in this study is the fact that "wild" or "unbalanced" cords seem to show better properties than the conventional balanced structures.

To summarize, we believe work on the following items may result in improvement in the so-called fatigue resistance of glass cords: (1) Improvement in cord construction to reduce filament to filament scratching and to improve the distribution of load between the various filaments. (2) The use of surface sizes, lubricants, or coatings

around each individual filament to produce an insulating medium to protect each filament from its neighbors. The major difficulty here is that some forms of lubrication may prevent satisfactory adhesion of rubber compounds to the glass surface. (3) Coating individual filaments of a strand with fairly hard resins so as to prevent movements of the filaments in relation to each other. The use of such resins tends to aid in distributing tensile loads uniformly throughout the mass. If such coated strands are made small enough, the required flexibility is retained when they are twisted and plied into cord structures.

Q. What are the advantages of surface treatment of glass yarns to reduce interfilament abrasion? Has a suitable adhesive for Fiberglas cord been discovered?

A. (*Mr. Penney.*) One of the advantages of surface treatments for glass yarns is to prevent the adsorption of water or water vapor on the surface of the glass since under these conditions the abrasion resistance between adjacent glass surfaces decreases materially. If properly chosen, these surface treatments may be used to promote adhesion between plastics and rubber compounds and the glass surface by acting as an intermediate bonding agent or cement.

With regard to the second part of this question, in producing coated fabrics we do not try to get too good adhesion between the coating material and the yarn, but attempt to have the glass fabric embedded mechanically in the coating compound. This embedding is accomplished by designing the fabric with enough openings to permit the coating compound to be forced through the interstices. The yarns may then slip or shift very slightly in service, and this condition appears to promote improved flexing and abrasion properties. It is questionable, however, whether the lubricants used on the yarns for coated fabric applications would be suitable for tire cord. We do find that natural rubber, nitrile type synthetic rubber, and polyester resins have reasonably good adhesion to glass, but we are convinced from work to date that further improvements will probably come from the technicians in the rubber industry, who as designers of tires, hose, belting, etc., and are in the best position to utilize the properties of new materials most effectively on the basis of past experience. We believe that Fiberglas can contribute much to the production of improved rubber goods, but careful and proper designing is most important.

Q. Can any change be made in the high stretch characteristic of nylon yarn or cord?

A. (*Dr. Owen.*) The elongation characteristics of nylon filaments seem to be inherent in the type of chemical compound from which they are made. At the present time we know of no way in which these elongation characteristics can be materially altered, nor do we anticipate a solution to this problem soon. A practical answer may be to use sufficient yarn to provide an elastic modulus suitable for the load to be applied or to compensate for this stretch through process changes in the particular applications involved.

Q. Are there nylons which have a different dimensional stability with regard to temperature than does Type 300?

A. (*Dr. Owen.*) The statement in the answer to the preceding question with respect to elongation and the nature of nylon also applies to dimensional stability at elevated temperatures. All nylons manufactured today have essentially the same response to temperature. The present types of this fiber have the best balance of properties that we know how to produce.

"Cold Rubber" Discussed

THE Los Angeles Rubber Group, Inc., held a regular meeting on March 1 at the Hotel Mayfair, Los Angeles, Calif. Approximately 191 members and guests attended the meeting, which consisted of an afternoon technical session, followed by a cocktail hour and dinner. The technical session, with Howard Erwin, Goodyear Synthetic Rubber Corp., presiding, featured a talk on "Compounding and Processing Low-Temperature GR-S" by Dickson M. Sheppard, chief chemist, Goodyear Tire & Rubber Co.

Mr. Sheppard's talk was in the nature of a progress report on current knowledge of processing and compounding cold rubber. Compounding practices used with standard GR-S can be used with cold rubber with little or no change, except for a small increase in accelerator content with resultant improvement in physical properties. Black loadings and requirements for zinc oxide and other chemicals are equivalent for the two types of GR-S. In processing, "cold rubber" differs from standard GR-S in that its Banbury power requirements are a little higher for individual mixes, but total mixing time has been lower, with little improvement in extrusion noted upon adding remills over the minimum amount. "Cold rubber" stocks tube hotter and smoother and show less shrinkage than does regular GR-S. The former shows a tendency toward reduced output per tuber screw revolution of as much as 35%. Excessive stiffness after cooling of "cold rubber" has resulted in some difficulties in applying tire treads, but has caused no trouble in molding.

The evening meeting was sponsored by Patterson-Ballagh Division, Byron Jackson Co., who donated door prizes won by R. L. Short, and D. Dreisbaugh, both of Kirkhill Rubber Co.; A. Falkenberg, American Mineral Spirits Co.; W. Bair, United States Rubber Co.; C. C. Thompson, Patterson-Ballagh; C. Fetzner, Monsanto Chemical Co.; Z. A. Dyer, L. A. Processing Co.; H. Jones, Molded Products Co.; and E. Wilson, Golden State Rubber Mills. After-dinner speaker was Capt. Hugh McDonald, Los Angeles County Sheriff's Office, who discussed "Juvenile Delinquency" and emphasized the importance of proper home life. A motion picture, "This Is America," was also shown.

Golf Tournament

The Los Angeles Group held its first golf tournament of the year on February 25 at the Montebello Country Club. Because of inclement weather, only 21 members participated in the tournament, which was preceded by lunch. Prizes were won by the following contestants: blind bogey, F. H. Kienzle, Braun Corp.; longest drive, E. A. Hensal, B. F. Goodrich Co.; single high score, C. H. Churchill, Sterling Rubber Products Co.; best approach, A. P. Stiller, Fullerton Mfg. Co.; least putts, A. H. Federico, C. P. Hall Co. of California; low gross, R. Grand, Goodrich; low net, J. Ballesio, Firestone Tire & Rubber Co.; and best putt, C. M. Reinke, Reinke & Amende.

Chicago Group Symposium

THE Chicago Rubber Group sponsored a symposium on "Trends in the Production and Use of Synthetic Rubber" at the Chicago Production Show, presented by the Chicago Technical Societies Council on March 15 at the Stevens Hotel, Chicago, Ill. B. F. Benson, Inland Rubber Co., was in charge of arrangements, and James T. Sheridan, New Jersey Zinc Co., was meeting chairman. C. E. Mills, factory manager, Corduroy Rubber Co., spoke on "Improvements in the Production and Performance of Tires"; Robert V. Yohe, president, American Anode Co., discussed "Problems in Production of Synthetic Rubbers"; and Paul L. Niessen, assistant works manager, Victor Mfg. & Gasket Co., dealt with "Production Problems Involved in Mechanical Rubber Goods and Gaskets."

Mr. Mills discussed some of the problems peculiar to tire production and their remedies. These problems include (1) distorted bead resulting from cutting the fabric at the wrong angle or setting the tire or airbag incorrectly in the mold; (2) waterlogging because of water trapped between the airbag and the tire carcass; (3) blisters resulting from foreign matter in the rubber compound; and (4) imperfectly filled tread design caused by improper flow of rubber in the mold. These problems and others can be eliminated by careful inspection during processing and by testing each batch of rubber. Other difficulties are overcome by a concerted attack on the problem by the whole industry; i.e., the development of a special synthetic rubber for bead insulation stocks has largely removed one of the tire compounder's worst problems. Some of the industry's problems are not easily solved; these include current overcapacity to produce tires and the tire industry's high overhead cost.

Dr. Yohe reviewed the job of creating a major chemical industry almost overnight when the government synthetic rubber program was put into effect in the early war years. Many guesses in design and formulation had to be made early in the program; in some cases construction of plants was actually under way before a decision was made on what type of process was necessary, or what reaction conditions were desirable.

Mr. Niessen said that some of the difficulties encountered in producing mechanical goods can be traced to the fact that engineers frequently design the rubber molds with tolerances appropriate to metals and forget that rubber is an elastic material which will shrink or acquire a permanent set. There is need of more information to be furnished by the purchaser on the use to which the rubber part will be put before there can be proper design of the part. Another difficulty is the setting up of specifications by the purchaser which are virtually impossible to meet and are not needed for the part. The work of ASTM and SAE committees in setting up specifications for rubber parts is a step in the right direction to eliminate this problem.

Pliolite in Paints

R. E. WORKMAN, St. Louis, Mo., representative of the chemical division, Goodyear Tire & Rubber Co., will be among the speakers at the convention of the Southern Paint & Varnish Club, to be held in Biloxi, Miss., on May 9 to 11. Mr. Workman's talk will be on "New Developments of High Styrene-Butadiene Copolymers in Protective Coatings," and will stress the application of Goodyear's Pliolite S-5 in such coatings. H. R. Thies, division manager, R. S. Earhart, W. C. Kirschner and C. O. McNeer will be present at the divisional exhibit, which will feature materials produced by Goodyear for the paint industry.

Goodyear Medal Award, Plant Trips, 25-Year Club Luncheon, and Clambake to Feature Boston A. C. S. Rubber Division Meeting

THE fifty-fourth meeting of the Division of Rubber Chemistry of the American Chemical Society will be held separate from the meeting of the parent Society and will take place in Boston, Mass., May 23, 24, and 25, at the Hotel Statler. In addition to the presentation of an outstanding group of 26 papers, more than half of which will deal with some aspect of the development and use of "cold rubber," the meeting will be featured by the award of the Goodyear Medal to Harry L. Fisher, U. S. Industrial Chemicals, Inc., at the Division banquet on Tuesday evening, May 24, and another luncheon meeting of the 25-Year Club on Monday under the chairmanship of John M. Bierer, Boston Woven Hose & Rubber Co.

H. I. Cramer, Sharples Chemicals, Inc., chairman of the Division, will open the meeting at 1:50 p.m., Monday afternoon, and will preside at the technical sessions beginning at that time and scheduled for Tuesday and Wednesday mornings and Wednesday afternoon, assisted by C. R. Haynes, Binney & Smith Co., Division secretary.

James C. Walton, Boston Woven Hose, chairman of the local committee on arrangements for the meeting, has made plans for an old-fashioned clambake at Marblehead on Monday evening, and transportation by buses along the scenic North Shore has been arranged. Since the clambake is to be held the first evening of the meeting and since advance preparations are necessary, tickets must be purchased before May 18, and none will be sold at the meeting.

Another special feature of this meeting will be plant inspection trips on Tuesday afternoon to the Boston Woven Hose, Dewey & Almy Chemical Co., Hood Rubber Co., and Simplex Wire & Cable Co. No technical session will be held on Tuesday afternoon, and special buses will be available to take members on the inspection trips.

The Division banquet will be held in the Imperial Ballroom of the Hotel Statler, beginning at 7:00 p.m., Tuesday evening. Chairman Cramer will preside, and H. E. Outcault, St. Joseph Lead Co., chairman of the Goodyear Medal Award Committee, will present the Medal to Dr. Fisher. John T. Blake, Simplex Wire, will speak on "The Achievements and Characteristics of the Medalist." The subject of Dr. Fisher's acceptance address will be "Rubber Research and the Need of a Rubber Research Institute in the United States."

The Division will be honored in having as its guest at the banquet, General George C. Kenney, U. S. Air Force, who will deliver an address.

There will be a suppliers' cocktail party preceding the banquet in the Georgian Room of the Hotel Statler. This affair has been arranged by a committee representing suppliers to the rubber industry, under the chairmanship of Owen J. Brown, Jr., Godfrey L. Cabot, Inc.

Ladies are invited to the banquet, and trips and other events have been arranged for their entertainment during the meeting.

The business meeting of the Division is scheduled for 11:00 to 11:20 a.m., Wednesday, May 25.

Abstracts of the papers to be presented at the technical sessions, including titles, authors' names and affiliations, together with the time and date of their presentation are given below. The first two sessions, those to be held on Monday afternoon and Tuesday morning, are devoted to "cold rubber" polymerization techniques and compounding and use of this new type GR-S.

Abstracts of Papers

MONDAY AFTERNOON—MAY 23

1:50 P.M. **Opening Remarks.** H. I. Cramer, chairman.

2:00 P.M. **Effects of Polymerization Temperature on Structure of GR-S and Polybutadiene.** A. W. Meyer, United States Rubber Co., Passaic, N. J.

This review paper relates changes in polymerization temperature to influence on the structure of butadiene polymers. The per cent unsaturation is near the theoretical expected for diene polymers and is little influenced by shifting the polymerization temperature or bound styrene content.

The per cent. 1,2 units in polybutadiene is 20-25%. Polymerization temperature has a slight effect on per cent. 1,2 addition, possibly causing a decrease of 3-4% when the temperature is dropped from 50 to —20° C. The addition of styrene as a comonomer does not influence the ratio of 1,2 to 1,4 addition.

There is a great increase in per cent. *trans* 1,4 content of butadiene polymers with decreasing polymerization temperature (50% at 100° C. *vs.* 80% at —20° C.). The presence of styrene as comonomer has little or no effect on per cent. *trans* 1,4 addition. The refractive index of polybutadiene decreases slightly with decreasing temperature of polymerization.

Reduction in polymerization temperature increases the structural regularity of butadiene polymers. Thus X-ray diffraction patterns of stretched polybutadiene polymerized at 20° C. and below indicate a repeat distance of 5.1 Å along the stretched polymer chains. This corresponds to a fully extended butadiene unit in the *trans* configuration. When styrene content of copolymers reaches 20%, even a —20° C. copolymer becomes amorphous. The rate of crystallization of polybutadiene is more rapid than that of natural rubber.

Polybutadiene prepared at 5° C. has T-50 values which are proportional to the amount of combined sulfur and indicate a tendency to crystallize. Polybutadiene made at 50° C. and 80 butadiene-20 styrene copolymerized at 5° C. do not give a significant T-50 value because of irregular structure. A smaller proportion of low molecular weight polymer is formed with decreasing temperature of polymerization. Osmotic and viscosity molecular weight relations indicate that there may be less branching at low polymerization temperatures.

2:25 P.M. **The Effect of Polymerization Temperature on the Properties and Structure of Polydienes.** Paul H. Johnson, Firestone Tire & Rubber Co., Akron, O.

Low temperature, activated polymerization techniques have been applied to the polymerization of butadiene and butadiene/isoprene (75/25) copolymers, and the physical properties of these compared with polybutadiene and polyisoprene made at 50° C. in several systems.

As was the case with butadiene/styrene copolymers, an improvement in the physical properties of the polydienes attended low polymerization temperatures. A tensile strength of 2150 p.s.i. was observed on a polybutadiene made at —25° C.; while 2900 p.s.i. was obtained on a butadiene/isoprene (75/25) copolymer made at —25° C. These polymers, when made in the GR-S system at 50° C., showed tensile values of 1400 and 1850 p.s.i., respectively.

The behavior of these polymers at low temperatures was examined by determining their bending modulus at temperatures ranging from 0 to —70° C. It was observed that the temperature of polymerization effected the low temperature characteristics. The polymers made at the lower temperatures reached a bending modulus of 10^4 p.s.i. at a much higher temperature than the corresponding polymer made at 50° C. For example, a polybutadiene made at 50° C. reached 10^4 p.s.i. at —69° C.; while one made at —40° C. reached this value at —20° C.

X-ray diffraction patterns of these polymers showed increased orientation of the molecules of polymers made at low temperatures. It is hypothesized that this phenomenon is attributable to increased linearity of the polymer chains when polymerization occurs at low temperatures.

The introduction of isoprene with its pendant methyl group reduced the temperature at which a bending modulus of 10^4 p.s.i. was reached, and the low temperature copolymer behaved in this respect quite similar to those dienes polymerized at 50° C. At the same time, however, improved tensile strengths were maintained. It is concluded that at least part of the advantage from low temperature polymerization is due to increased linearity of of the polymeric chains.

2:45 P.M. **Infrared Analysis of Low Temperature Polymers.** Robert R. Hampton, U. S. Rubber, Passaic.

The advent of "cold rubber" has emphasized the importance of analytical methods for studying isomerism in polymers, interest in which was first aroused by the remarkably different properties of balata, rubber, and synthetic polyisoprene. Infrared analyses of butadiene-styrene polymers show that, at temperatures of 41° F. or below the butadiene units which enter the polymer chain by 1,4 addition are almost entirely in the *trans* configuration; whereas at 122° F. a considerable proportion of the *cis* isomer is also formed. The amount of 1,2 addition is not significantly affected by temperature, in emulsion polymerization, although the sodium catalyzed polymerization of butadiene is preponderantly by 1,2 addition.

Infrared methods are described for the determination of unsaturation and combined styrene. The errors inherent in the use of low molecular weight olefin standards are avoided by the use of polymer standards; sodium polymerized, high temperature emulsion polymerized, and low temperature emulsion polymerized polybutadiene samples are used, respectively, as standards for the determination of 1,2, *cis* 1,4, and *trans* 1,4 double-bonds. By a series of successive approximations it is possible to correct for the isomeric impurities in the standards and to calculate accurately the extinction coefficients for each of the three polybutadiene isomers.

By the use of these methods it is possible to identify standard and cold GR-S and to measure the effects of variation in polymerization conditions, thus guiding research into the most fruitful channels.

3:05 P.M. **The Viscosity-Molecular Weight Relation for Polybutadiene.** Effect of Polymerization Temperature. B. L. Johnson and R. D. Wolfangel, Firestone.

The relation between intrinsic viscosity

and number average molecular weight has been determined for polybutadiene polymerized at three temperatures. The viscosity of polybutadiene made at 50° C. is related to molecular weight as follows: $[\eta] = 72.5 \times 10^{-4} \cdot M^{0.45}$. Lowering of the polymerization temperature to 5° C. changes the relation to $[\eta] = 26.4 \times 10^{-4} \cdot M^{0.55}$; while a further decrease in polymerization temperature to —20° C. results in a relation of $[\eta] = 10.6 \times 10^{-4} \cdot M^{0.63}$. The increase in the exponent in the above relation is the result of a higher intrinsic viscosity per unit molecular weight and is indicative of an increase in the average dimensions of the polybutadiene molecule as polymerization temperature is decreased. These results are in agreement with structural changes such as an increase in *trans* configuration and 1,4 addition and a decrease in branching, all of which would result in a more extended polymer molecule based on an equivalent number of butadiene units in the chain.

The high intrinsic viscosity per unit molecular weight, as indicated by the larger exponent in the viscosity molecular weight relation for polybutadiene made at low temperature, is a desirable characteristic in a polymer for general-purpose usage since it indicates less *cis-trans* heterogeneity and more linearity in the elastomer.

3:25 P.M. **GR-S Latex Polymerized at Low Temperatures.** H. S. Smith, H. G. Werner, J. C. Madigan, L. H. Howland, U. S. Rubber, Naugatuck, Conn.

Conventional GR-S latices have very poor wet strength, as compared to natural latex, and also cannot be obtained with high gum tensile unless low temperature stiffening characteristics are sacrificed. These shortcomings exclude GR-S latex from many applications and necessitate admixture with large proportions of natural latex in other cases. Polymerization at low temperatures results in great improvement of both of these properties without sacrifice of other desirable characteristics.

To obtain reasonable reaction rates at low temperature, an activator must be used with the catalyst. In initial latex work the conventional iron-pyrophosphate-sugar activation system used in dry polymer work was employed. In this case the hygroscopic properties of the sugar prevented proper drying of latex films. Although elimination of the sugar helped somewhat, the pyrophosphate is sufficiently hygroscopic to give trouble. These difficulties were eliminated by the adoption of a special activator system which not only is non-hygroscopic, but also made possible a reduction in the electrolyte content of the latex.

Soaps presented another problem in low temperature polymerization. For some reason it is difficult to obtain satisfactory films from latex made on the lower fatty acids. Thus far it has been impossible to obtain satisfactory activation of rosin soap latices with the special activator system. A good compromise was reached, however, by employing a mixture of rosin and fatty acids.

Since latex quality is impaired at conversions above 60%, it is impossible to obtain solids above 50% even in the conventional high-solids-type formula. Suitable methods for concentration to 60% solids are being investigated.

3:45 P.M. **The Use of Alternative Activators in the 41° F. Polymerization Recipes.** H. Leverne Williams, Polymer Corp., Ltd., Sarnia, Ont., Canada.

In two well-known 41° F. formulae, X-435 and the Phillips Custom, the pyrophosphate can be replaced by organic compounds capable of forming complexes with iron. The order of effectiveness of materials studied was ethylene dinitrilo tetra acetic acid, o-phenanthroline, a,a'-bipyridyl, nitrilo triacetic acid, citrate, salicylate, tartrate, etc. The first-mentioned substance was particularly good and was the subject of a more intensive investigation. It was found that recipes developed required remarkably little iron; less than 0.025-part of ferrous sulfate heptahydrate was sufficient for a practical rate of conversion. In addition, the formula was reproducible and insensitive to the amount of iron, although somewhat more sensitive to the amounts of complexing agent, sugar, or cumene hydroperoxide. An unexpected result was a rapid conversion with no iron at all, making it possible to prepare iron-free polymers. However the complex seemed to be formed and to be active under conditions unfavorable for the formation of ferrous pyrophosphate.

Active complexes could be prepared with other metals, notably ferric salts, stannous, chromous, and (probably) copper and aluminum. Complexes could be prepared with many other metals too, but they seemed inactive or even deleterious. Particularly attractive techniques were devised using an invert suger which required no further digestion. Such a formula was scarcely more difficult to charge than the Mutual recipe.

Tuesday Morning—May 24

9:00 A.M. **Effects of Temperature of Polymerization of GR-S on the Quality of Tire Tread Stocks.** A Review of Information Obtained in the Government Synthetic Rubber Program. L. M. White, U. S. Rubber, Passaic.

Some good general papers on the effects of reducing the temperature of polymerization of GR-S type synthetic rubber have been presented or published previously. All of these, however, have dealt with a relatively very small amount of data, or else have discussed only in qualitative terms the effects of temperature of polymerization on the properties of GR-S. The present paper is a survey of the very large amount of information collected in the Government Synthetic Rubber Program and an attempt to establish the quantitative effects. This review is limited to GR-S types containing 20-30% bound styrene and compounded into tread-type formulations.

Continual reduction of the temperature of polymerization from 50° C. (122° F.) to —10° C. (14° F.) appears to result in linear changes in most physical properties.

The major advantages of reducing polymerization temperature from 50 to —10° C. are: tensile strength at break, at R.T., at 212° F., and after aging, 20-30% higher; elongation at break, at R.T., at 212° F., and after aging, 10-15% higher; cut growth rate: unaged, at least 50% lower, aged, 40% lower; tire tread cracking rate, 50% lower; tire tread wear, 30% better. Small improvements are made in hysteresis properties as judged by heat development and rebound tests. No change was found in the retention of tensile and elongation properties when "cold rubber" was tested at 212° F. or after aging.

The only significant disadvantages noted from reducing temperature of polymerization from 50 to —10° C. are: Increase in the work required to mix stocks—the ratio of compound viscosity to polymer viscosity increases about 20%. "Marching modulus" —increase in stress at 200% elongation on aging is 15% greater. Retention of cut growth resistance after aging—the ratio of aged to unaged cut growth resistance decreases by at least 25%.

9:25 A.M. **Cold Rubber—Its Quality and Its Adaptability to Tires.** J. H. Fielding, Goodyear Tire & Rubber Co., Akron.

The superiority of "cold rubber" (GR-S polymerized at 41° F.) over Standard GR-S is beyond question. GR-S is inferior to natural rubber in most respects. GR-S has successfully replaced natural rubber in those tires and those types of service in which its deficiencies are least apparent or where its advantages are brought out. It has never, even under wartime stringency, permitted the industry to do without some amount of natural rubber. "Cold rubber" is definitely better than GR-S and is an important step in the direction matching the properties of natural rubber by chemical synthesis. "Cold rubber" is not yet the equal of natural rubber.

Factual data are presented comparing GR-S, "cold rubber," and natural rubber in the physical properties ordinarily important to a tire manufacturer. Road test data involving a sufficient number of tires to establish the position of "cold rubber" clearly are presented. Because several different carbon black types are involved, the individual contributions of polymer and black are identified.

It is apparent that tires of better wear resistance than before are possible with "cold rubber," but other deficiencies of the polymer will limit the extent to which it can replace natural rubber.

9:50 A.M. **Some Comments on Processing and Tire Service Characteristics of "Cold Rubber."** I. J. Sjothun and O. D. Cole, Firestone.

With considerable interest in "cold rubber" and the expansion of low temperature production facilities in the industry, it was thought that a summary of the passenger-tire test results obtained by this laboratory would be helpful to all concerned.

Commercial "cold rubber" polymers gave 10 to 20% improvement over GR-S in tread wear. The replacement of channel by various fine furnace blacks gave an additional 10-30% improvement. Tread cracking resistance of "cold rubber" was at least equal, if not superior to that of GR-S. Artificially aged tires also showed the low temperature polymer about equal to GR-S for aging as measured by tread wear, tread cracking and chipping. Traction on ice and snow is equal to that of GR-S from 20-30° F., but inferior at 0° F. Traction on wet pavement was equal. For the most part synthetic polymers were up to 15% poorer than natural rubber for traction on ice and snow, but were up to 10% better on wet pavements at temperatures above 40° F. Preliminary tests have indicated that "cold rubber" is unsuitable for large truck tires.

Low temperature polymers have generally been produced at higher viscosity levels than GR-S, but have been found satisfactory for processing. Fine furnace blacks were an aid for providing smoother and more uniform extrusion, but added to the scorching tendencies. Other processing characteristics appeared satisfactory. Building tack was no better than that of GR-S-10.

To date, the variability of the polymer has been greater than that of GR-S. Most physical properties of the low temperature polymers have fallen between those of GR-S and natural rubber. This condition was true particularly of tensile, elongation, heat generation, and resilience.

10:15 A.M. **A Study of Channel-Type Carbon Blacks in Low Temperature GR-S.** E. M. Dannenberg and H. J. Collyer, Godfrey L. Cabot, Inc., Boston.

The use of channel carbon blacks in combination with the recent low temperature chemical rubbers for tires has received little attention in the published literature. This paper presents information on the properties in "cold rubber" of a

variety of channel blacks covering their complete range of particle size.

Since the new high abrasion types of furnace blacks (HAF) have become well established for use in "cold rubber," it is necessary to compare the fundamental properties of the HAF blacks and channel blacks in an attempt to evaluate the determining factors in their performance. It is generally accepted that rubber reinforcement is influenced primarily by particle size. This relation is valid for "cold rubber," and the finer channel blacks give greater reinforcement.

A medium grade of channel black (MPC) has not shown the reinforcing ability of the HAF blacks. It has been established that these blacks are about the same in average particle size, and the reason for the difference in reinforcing ability must be attributed to other fundamental factors. Electron microscopic examination shows MPC black to be finer in average particle size and to have narrower particle size frequency distribution than HAF black. The particle size weight distribution curves of HAF and MPC blacks show even more strikingly the differences between the two types. At a given weight loading in a rubber compound the number of reinforcing particles per unit volume is significantly larger in the case of an MPC black than it is for HAF black. From such particle size distribution data it would also be anticipated that MPC black is more reinforcing than HAF black. Evidence is presented showing that the major factor responsible for this superiority of HAF black over MPC black is in its relative freedom from chemisorbed surface oxygen, and the consequent beneficial effect on cure resulting in improved vulcanizate properties. Removal of the chemisorbed oxygen associated with channel blacks improves their curing properties in "cold rubber" and eliminates to a large degree the differences in reinforcement between HAF black and channel black of comparable particle size.

10:40 A.M. **Carbon Gel Formation in "Cold Rubber."** C. W. Sweitzer, W. C. Goodrich, K. A. Burgess, Columbian Carbon Co., New York, N. Y.

Bound rubber has been described as an index to carbon reinforcement and wear in "cold rubber" treads. Experiments described in this paper show that many factors influence the development and measurement of carbon gel of which bound rubber is a part; these factors include the grade of carbon black, the type of polymer, the time of resting after mixing, and the extraction temperature. Temperature of mixing, however, is revealed as having the most pronounced effect on the formation of carbon gel, with increased temperature resulting in higher carbon gel values. Correlation between carbon gel and physical properties contributing to reinforcement are delineated.

11:00 A.M. **Pilot-Plant Preparation of Chemical Rubber by a Continuous Process at Low Temperatures.** R. W. Laundrie and R. F. McCann, Government Laboratories, University of Akron, Akron.

The Office of Rubber Reserve recently authorized the conversion of approximately one-half the capacity of the operating GR-S copolymer plants to the production of low temperature polymerized GR-S. Since many of the plants are now producing standard GR-S at 117° F. by a continuous process, investigation of continuous polymerizations conducted in the pilot-plant of the Government Laboratories has been spurred considerably so that suitable polymerization formulae, basic operating techniques, and pertinent data may be available for future design and operation of synthetic rubber plants.

Three of the best formulations developed for the batchwise preparation of chemical rubber were utilized in pilot-plant runs conducted at 41° F. in a continuous polymerization unit consisting of 12, 20-gallon reactors connected in series (total capacity of 287 gallons): (1) a formula containing about 3% of commercial dextrose as the reductant; (2) a formula with approximately 1% of commercial dextrose; and (3) a formula without dextrose.

Cumene hydroperoxide as the oxidant and ferrous iron salts as the activating medium were utilized in each formulation with a monomer ratio of 72/28 butadiene/styrene, by weight. Experimental lots (5,000 to 10,000 pounds of polymer in each) were prepared and have been distributed to the various rubber companies for evaluation and factory processing tests and for comparison in tires with standard GR-S and with low temperature GR-S made by a batchwise process.

The advantages of the continuous polymerization process at low temperatures are: (a) ease of control of temperature; (b) variations in the conversion levels attained and in the Mooney viscosities of the final polymers, when adequately shortstopped, appear less than those encountered in batchwise low temperature polymerization; (c) the physical and chemical properties of the product, as disclosed by laboratory tests, are equal to those of similar polymer prepared batchwise.

11:20 A.M. **Low Temperature Polymerizations—**Emulsifiers of the Alkyl Aromatic Sulfonate Type. W. A. Schulze, C. M. Tucker, W. W. Crouch, Phillips Petroleum Co., Bartlesville, Okla.

One of the important factors in the emulsion polymerization process for the production of low temperature GR-S is the type and the amount of emulsifier used. Laboratory and pilot-plant studies now have been made in which salts of alkyl aromatic sulfonates have been used for that purpose in redox recipes at 41° F., employing peroxidic catalysts, and aged ferropyrophosphate activators. Salts of long-chain alkylbenzene sulfonates, of the type now widely used in many of the new synthetic household detergents, were found very satisfactory from the standpoint of promoting rapid polymerization rates to give fluid latices of satisfactory stability. With most of the commercial products of this type, however, treatment to remove inorganic salts, unsulfonated hydrocarbons, and other impurities is required for best results.

It is of particular interest that salts of alkyl aromatic sulfonates function effectively in concentrations much lower than can be employed with the usual emulsifiers. Very satisfactory results were obtained, particularly by use of highly active experimental catalysts such as Diox, in recipes in which the charge of emulsifier was reduced from 5.0 down to as low as 0.50-part. Also, the process is believed to have promise for use in the preparation of special latices or for producing polymers of controlled organic acid contents.

11:40 A.M. **Non - Aqueous Emulsion Polymerization Systems.** Edward Carr and P. H. Johnson, Firestone.

Formamide was tried as antifreeze for low temperature polymerization at —10° C. in an MP-189-S emulsified, benzoyl peroxide-sugar redox recipe. The rate of polymerization was considerably lower than for the corresponding recipe with methanol antifreeze. The unmodified polymer of 32% conversion showed satisfactory breakdown characteristics when milled ten passes on a cold mill.

Formamide was also investigated as a water-free emulsion polymerization medium. Its application in this field had been indicated by work of Carothers,[1] and in the present work was extended to the emulsion copolymerization of butadiene and styrene and the homopolymerization of vinyl monomers. It was found that polymerization proceded readily in this medium, by an emulsion mechanism as evidenced by the formation of a latex, using a persulfate-mercaptan recipe. The latex was similar to a water latex in general characteristics. The rate of polymerization in formamide (72% conversion in 26.5 hours) was somewhat lower than in the water system (72% conversion in 12 hours). The rate was increased somewhat by adding some acrylonitrile. Attempts to accelerate the rate by the use of a diazothioether gave negative results.

A high solids latex of butadiene/styrene 75/25 was prepared in formamide. The conversion reached 100% in 48 hours. The latex was very viscous.

The butadiene/styrene copolymer obtained in this system was similar to GR-S.

Exploratory experiments were performed with the objective of adapting liquid ammonia to emulsion polymerization. Liquid ammonia was completely substituted for water in a workable aqueous recipe utilizing butadiene and styrene as comonomers. At the lowest bath temperature employed (—24° C.) the monomers were miscible with liquid ammonia, thus presumably precluding an emulsion polymerization mechanism. This recipe gave no evidence of polymerization in 41 hours at —24° C. At somewhat lower temperatures a two-phase system can be established, and future work will be aimed at effecting emulsion polymerization in such liquid ammonia recipes.

Formic acid was tested as an emulsion polymerization system, using recipe components commonly effective in water. Polymerization could not be initiated in this medium, however, by the means employed.

Wednesday Morning—May 25

9:00 A.M. **Peptization of Low Temperature GR-S.** E. L. Stangor and R. R. Radcliff, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

The factory processing of low temperature GR-S polymers, such as X-432, X-478 and X-485, is more difficult than that of standard GR-S owing to the lack of breakdown when the polymer is masticated under normal conditions on a mill or in a Banbury. When the mastication is carried out in the presence of an aromatic mercaptan or combinations of mercaptan and diphenyl-para-phenylene-diamine, the results obtained depend upon: (1) the temperature of mastication, (2) the time of mastication, and (3) the concentration of peptizing agent employed.

Data presented show the results obtained in a laboratory Banbury when each of these three factors is varied. Based upon Mooney viscosity values, the data show that increasing the time of breakdown, particularly at high temperatures, generally results in a toughening of the elastomer. The addition of small amounts of an aromatic mercaptan will not overcome this effect and, in fact, will sometimes enhance it. The best results (greatest amount of softening) are obtained when quantities of mercaptan approaching 1.0 part per 100.0 parts of elastomer are used, and mastication is carried out for approximately five minutes at a temperature below 350° F.

9:20 A.M. **Physical Evaluation of Foamed Latex Sponge.** F. S. Conant and L. A. Wohler, Firestone.

Testing methods are described for evaluation of tensile strength, compression modu-

[1] United States patent No. 2,080,558 (1937).

lus and fatigue resistance of foamed latex sponge. Quality indices based on tensile strength and on compression characteristics are discussed. Compression modulus *vs.* per cent. compression curves are shown to be parabolic, implying that the principal mechanism of compression of foamed latex sponge is a buckling of the cell wall remnants. An application of the evaluation methods to studying the effect of maturation time of raw *Hevea* compound is given. Effects of density on the physical properties of *Hevea*, 50 *Hevea*/50 GR-S, and neoprene foamed latices are given. A physical basis is postulated for the greater comfort of sponge rubber cushions as compared to coil steel spring cushions.

9:50 A.M. **Molding and Casting Processes Using Rubber Latex.** S. C. Stokes, British Rubber Producers Research Association, Welwyn Garden City, England.

The literature on the subject of molding and casting latex in porous and non-porous (metal) molds is reviewed. These methods date back many years, but there are recent developments, for example in the field of heat sensitized latex, and reference is made to the French work with artificially aged latex, and the use of Igevin M 50 by the Germans.

The advantages and disadvantages of all the established methods are discussed by way of introduction to a detailed description of the production of articles of several types from porous molds.

The technique of the manufacture of hollow articles from latex using plaster molds is described, with particular reference to the production toys of pure gum and figures for advertising, display, and educational purposes using loaded latices to give hard models. Both soft and hard articles can be surface painted to give attractive finishes.

There are certain advantages in using latex for hard figures in comparison with *papier maché* or plaster of Paris, and the comparative simplicity of the operation enables the *papier maché* figure manufacturer to change over to latex with but little alteration to plant, etc.

Mention is made of the use of latex-rubber molds for casting models of plaster or resin, and the comparison of such molds with those prepared from "fluid rubber." Both types of rubber molds have certain advantages over those made from gelatine and also over the more recently developed plastic molds.

10:15 A.M. **An Accelerated Weathering Test for Elastomers.** W. E. Phillips, B. F. Goodrich Co., Akron.

The rate of weathering of stretched or looped one- by six- by 0.094-inch samples mounted on boards, as specified by ASTM-D518-44, was found to be very slow, and the results difficult to evaluate. A new accelerated static weathering test was developed in which the samples were mounted over a metal reflector for the purpose of exposing the back and the front of the samples to sunlight simultaneously. The thickness of the samples was also reduced from 0.094- to 0.020-inch, which accelerated the rate of tensile loss on weathering of stretched dumbbells by about 15 times. This corresponds to doubling the rate of deterioration for each reduction in thickness of 0.019-inch. As the weathering resistance is improved, it is proposed to reduce the thickness of the samples.

The rate of weathering can be evaluated much more accurately by physical tests such as stress-strain than by observation of the appearance of the sample. Several samples which were equally cracked after weathering showed wide variations in the rate of tensile loss. Other samples which showed no surface cracking also had different rates of tensile loss on weathering. Other physical and chemical tests are suggested for use in combination with this method of exposing samples for evaluating the rate of weathering. Methods are suggested for separating the effects of light, ozone and oxygen as factors in weathering. Charts and tables are presented showing the results of weathering of the following stretched (20%) and unstretched samples: (1) natural rubber containing 20 and 40 volumes of different grades of whiting; (2) blends of natural rubber with GR-S and nitrile rubbers; (3) whiting and clay-loaded natural rubber compounds containing different age resisters.

10:40 A.M. **A Comparison of Some Reclaimed Rubbers.** H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Corp., Chicago, Ill.

The use of GR-S in tires has necessitated changes in methods of reclaiming tire scrap. The alkali reclaiming process is largely superseded by some of the neutral processes.

A comparison has been made between commercial whole tire alkali and neutral process reclaims to determine what effect, if any, a modification in the reclaiming process may have on certain physical properties of rubber compounds. The reclaims were tested in the standard reclaim test compound and in a rubber compound in which 40 parts natural rubber were replaced by reclaimed rubber hydrocarbon. Water absorption, resilience, compression set, low temperature brittleness, and flexing tests were made besides the usual physical tests before and after oven aging. Tests of reclaims in the reclaim test compound show considerable variation. Some alkali and neutral reclaims give equivalent results; while others do not. In the natural rubber compound the alkali reclaims give higher water absorption, higher resilience, greater resistance to flex cracking, and lower torsional hysteresis; whereas the neutral reclaims give lower compression set and better low temperature characteristics.

These results indicate that reclaims are available or may be made which impart properties to rubber compounds that are of vital interest to the rubber technologist.

11:05-11:20 A.M. **Business Meeting**

11:20 A.M. **Hysteresis Determinations with the Goodyear-Roelig Machine.** C. S. Wilkinson, Jr., and S. D. Gehman, Goodyear.

A description is given of a Roelig type of testing machine in which the test piece, under compression loading, was mechanically oscillated by a continuously adjustable eccentric weight rotated by a variable speed motor. The hysteresis loop was traced by means of a light beam deflected by a system of optical levers in connection with a dynamometer. Photographic recording was advantageous although the loops may also be traced on paper. The machine was found to be versatile for the selection of combinations of conditions such as frequency, force, and amplitude over the operating range. Temperature rise during some of the tests was measured by a needle thermocouple to compare with hysteresis values from the loop.

The effects of operational variables were investigated. These include duration of the test, frequency, and static and dynamic load. Data were secured for hysteresis determinations for synthetic polymers and *Hevea* compounds. Tests on the same compounds were made by other methods of hysteresis evaluation. Determinations with the Goodyear vibrotester, rebound pendulum, and flexometers were compared with results from the Roelig machine. Differences in the results could be reasonably interpreted on the basis of the different conditions of measurement and calculation. The importance of understanding the significance of a particular method of hysteresis determination for any specific application is thereby emphasized.

11:40 A.M. **A Constant Stress Method for Elongation of Soft Polymeric Materials.** C. A. Dahlquist, J. O. Hendricks, N. W. Taylor, Minnesota Mining & Mfg. Co., St. Paul, Minn.

In the study of long-range elastic properties of soft polymeric materials the investigators designed an apparatus to maintain constant stress on films during elongation. This condition is accomplished by means of a weight in the shape of an hyperboloid. As the film stretches, the weight is lowered into a liquid, and buoyancy reduces the load in proportion to the change in cross-sectional area of the test specimen, thereby maintaining constant unit stress.

Data on such materials as natural rubber, GR-S, Vistanex, Hycar OR-25, Hycar PA, polymethyl acrylate, and polyvinyl acetate are presented. Creep curves have been fitted by equations of the form.

$$E = I + L_1(1-e^{-k_1t}) + L_2(1-e^{-k_2t}) \ldots\ldots\ldots + k_vt$$

where E is the elongation at time t, I is the "instantaneous" elongation, $L(1-e^{-kt})$ terms are delayed elastic processes having different relaxation times, and k_vt is viscous flow.

It was found that elastic elongation in the time range of 0.03-minute to 1,000 minutes could be closely approximated by equations containing four to six relaxation terms. When means were provided for recording elongation from zero time, the initial elongation previously included in the I term could also be represented by relaxation processes. It is likely that any creep curve could be approximated very closely with six to ten relaxation terms even though a very large number of delayed elastic processes is involved. Owing to inertia of the load and oscillations in the 0 to 0.01-minute range the method does not permit determination of an "instantaneous" elongation

Recovery of the films was measured and found to be dependent on duration of stress. Films elongated 24 hours continued to show slow recovery after two months. Highly delayed elasticity was very difficult to distinguish from true viscous flow.

Curves showing change in modulus with time of elongation in the range 0.01-minute to 10 minutes appear to have the most practical value. They have been especially useful in evaluation of plasticized gum rubber compounds too soft to be tested by commercial tensile testing machines.

WEDNESDAY AFTERNOON—MAY 25

2:00 P.M. **Practical Aspects of Factory Scorch Control.** D. Chalmers, Gates Rubber Co., Denver, Colo.

Losses related to scorching in factory operations have been a common industry problem since the advent of organic acceleration. Reviewed are highlights of literature treatment of this problem with respect to methods of measurement, processing precautions, and formulations.

Renewed interest is justified in this problem because of the rapid return to scorchier natural rubber stocks, higher processing speeds, increased dynamic requirements, compounds necessitating tighter cures, and the introduction of fast curing blacks.

This paper describes a factory-scale program, an approach notably lacking in existing publications. The paper also covers the manner of selecting one of the many methods of scorch testing. Useful approximations for minimum necessary resistance to scorching are supported by data on

practical factory compounds processed in volume on a factory scale.

Interesting further correlations are presented on the dollar cost of scorching performance. These permit examples of approaching the problem of scorch prevention and control by economic reasoning.

There is summarized the respective contribution of compounders, process and mechanical engineers, supervision, and chemical suppliers.

2:20 P.M. **A New Vulcanization Process Replacement of Zinc Oxide by Use of Oxidizing Agents.** B. C. Barton, U. S. Rubber Co., Passaic.

A new vulcanization process has been discovered in which various mild oxidizing agents such as 2,2'-dibenzothiazyl disulfide, N-nitrosodiphenylamine, and quinone-bisphenylimine replace much of the sulfur and all of the zinc oxide and fatty acid of conventional accelerated sulfur compounds.

Rubber compounds containing no zinc oxide were not uncommon before the advent of organic accelerators. In these compounds, however, relatively large amounts of sulfur were required for desirable physical properties. With the development of modern accelerators, the use of zinc oxide, together with greatly reduced sulfur concentration became the universal practice. When zinc oxide is not present in these low sulfur compounds, little or no vulcanization occurs.

A simplified mechanism is described in which vulcanization of conventional accelerated compounds containing zinc oxide is shown to be a two-step oxidation process in which zinc oxide or zinc soaps function through their ability to form zinc mercaptides which are more readily oxidized by sulphur to disulfide cross-links than are thiol groups.

Consideration of this mechanism has led to replacement of all of the zinc oxide and that portion of the sulfur taking part in the second step of the vulcanization reaction by certain mild oxidizing agents. Well-vulcanized stocks can be obtained with considerably less sulfur than is used in conventional zinc oxide compounds.

The mechanism of vulcanization of the new system is discussed in some detail.

2:45 P.M. **Comparison of Properties of Butadiene and Isoprene Polymers Prepared by Alfin and Emulsion Processes.** J. D. D'Ianni, F. J. Naples, J. E. Field, Goodyear.

A series of synthetic rubber (polybutadiene, butadiene-styrene copolymers 90-10, 80-20, 70-30, and polyisoprene) was prepared by the conventional emulsion polymerization process used for GR-S. For comparison a similar series was prepared in pentane solution with an Alfin catalyst (a complex of sodium isopropoxide and allyl sodium) discovered by Prof. A. A. Morton (Massachusetts Institute of Technology). Use of the Alfin catalyst resulted in an extremely rapid rate of polymerization and gave 65-90% yield of polymer in 30 minutes at 30° C.

In a detailed study of the physical characteristics it was found that, compared to the corresponding emulsion polymer, the Alfin polymer was of much higher average molecular weight (as measured by inherent viscosity), had a higher gel content, contained substantially more external double bonds (as determined by perbenzoic acid titration), and showed lower values for density and refractive index. Infrared absorption studies confirmed the evidence above for a higher percentage of external double-bonds in the Alfin polymers and also indicated a greater proportion of the *trans*-configuration around the internal double-bonds than in the emulsion polymers. X-ray diffraction patterns showed a crystalline component, in the structure of Alfin polybutadiene, the amount of which decreased with increasing styrene content. In contrast, Alfin polyisoprene and all the emulsion polymers gave amorphous X-ray diffraction patterns under the conditions of test.

Gum and tread stocks of all the polymers were prepared for evaluation. Alfin polybutadiene exhibited higher tensile strength and improved abrasion resistance as compared to emulsion polybutadiene, but showed higher values for the stiffening point and freezing point.

3:05 P.M. **The Control of Crystallization in Neoprene.** L. R. Mayo, du Pont.

The ability of the general-purpose neoprenes to crystallize under conditions of stress, or exposure to favorable temperatures, results in patterns of behavior which may or may not be desirable depending on the practical application involved.

Properties which may vary with the degree of crystallization include: (1) tensile strength; (2) shape of stress-strain curve; (3) rate of stiffening in cured and uncured stock; (4) stress and compression set at low temperatures. It is obviously desirable to be able to control variations in such properties since they may significantly influence both processing characteristics and vulcanizate properties.

Means by which crystallization may be controlled include: (1) variation in state of cure; (2) addition of specific softeners; (3) use of sulfur as a curing agent; (4) copolymerization of a second monomer during manufacture of the elastomer. The relative advantages and limitations of these methods are discussed, and qualitative explanations of the mechanisms involved are offered. The application of these methods individually, or in combination, to the solution of specific problems deriving from the crystallization of neoprene is illustrated.

Much of the data is summarized in curves and charts showing changes in stress, strain, hardness, and compression set attributable to crystallization. Further evidence in the form of X-ray diffraction measurements is presented and correlated where possible with physical test data.

Gates Club Meets

THE February 3 dinner-meeting of the Gates Technical Club, at Cunningham's Restaurant, Denver, Colo., featured a talk on "Rubber Plantations Since the War," by D. A. Patterson, president of H. A. Astlett Co., rubber importer. This talk covered present conditions of rubber plantations in Malaya, Dutch East Indies, Sumatra, Java, and Ceylon, including methods used for growing, collecting, and drying of rubber latex. The speaker also treated of market conditions and rubber grading under the current more direct relation between grower and buyer than existed before the war.

The Gates Club next met March 2 at the Edelweiss Restaurant, Denver, attracting 80 members and guests. After a cocktail hour and dinner, John Weld, western regional public relations manager for Ford Motor Co., spoke on "What to Expect in the Automobile of Tomorrow." He discussed design trends in the automobile industry, including overall dimensions of automobiles. The motor is expected to be moved farther up over the front axle for better riding qualities. Studies indicate that the public wants a big car for a small price, rather than a small car, the speaker said.

New Reclaiming Process

A TALK on "A New Reclaiming Process," by J. G. Augenstein and E. Sverdrup, U. S. Rubber Reclaiming Co., was the feature of the March 8 dinner-meeting of the Ontario Rubber Section, C.I.C. Approximately 60 members and guests attended the meeting, held at the University of Toronto.

Using slides to illustrate the talk, Mr. Sverdrup reviewed the basic research which led to the development of the new reclaiming process, known as the dip process. This process is continuous, and devulcanization is brought about on thin layers of suitably ground and cleaned scrap, mixed with required plasticizing agents, at temperatures of about 338° F. The whole process, from cracking to refining, takes about 2½ hours, as compared with four days for conventional processes. Scrap must be carefully blended before processing, and strict control is maintained over plasticity. The actual devulcanization period takes about 10 minutes. Mr. Sverdrup explained that the name, dip process, comes from the fact that the scrap rubber, when devulcanized at high temperatures, shows a very sharp dip in Williams plasticity, followed by a rapid hardening. This hardening is inhibited by rapid cooling immediately after the plasticity dip occurs.

Mr. Augenstein described some of the characteristics of reclaims produced by the dip process and presented some compounding data comparing them with conventional reclaims. These dip process reclaims are extremely soft and have lower specific gravities than conventional reclaims. The former also are extremely free from metal and possess much better abrasion resistance. These reclaims are a little slower curing than conventional reclaims, except for tube types, which are faster curing for some unknown reason. Carbon black and accelerator are added during the process to improve the tensile strength and curing rate of these new reclaims.

The Section will hold its annual joint meeting with the Buffalo Rubber Group on May 6 at the General Brock Hotel, Niagara Falls, Ont. Featured speaker will be R. P. Dinsmore, vice president of Goodyear Tire & Rubber Co.

Buffalo Group Hears Searer

A TALK by Jay Searer, director of research and development, Durez Plastics & Chemicals, Inc., on "Phenolic Resins in Natural and Synthetic Rubber Compounds" featured the March 22 dinner-meeting of the Buffalo Rubber Group. Attended by 34 members and guests, the meeting took place at the Hotel Westbrook.

Early phenolic resins were not compatible with natural rubber, Dr. Searer said, and the first successful combinations were made with nitrile rubber. Rubber hardness increases very rapidly with increasing phenolic resin content; while tensile strength and a surprisingly high elongation are maintained. Various types of resins have been developed for use in natural, nitrile, GR-S, and neoprene rubber compounds and solvent cements, for product applications varying from artificial leathers to ebonites.

C. M. Bell, Durez purchasing agent, also spoke briefly on the relation between purchasing agent and salesmen. It was announced that the date of the Group's annual summer outing, at the Lancaster Country Club, has been changed to July 30.

Chase and Thiessen at Boston

THE Spring meeting of the Boston Rubber Group, held on March 25 at the Somerset Hotel, Boston, Mass., attracted about 350 members and guests. At the technical meeting following dinner, Donald C. Chase, of Farrel-Birmingham Co., Inc., spoke on "Modern Machinery for Rubber and Plastics," and Gilbert Thiessen, Koppers, Inc., discussed "Plastics and Elastomers! Whence the Raw Materials."

Bernard H. Capen, Tyer Rubber Co., chairman of the Group, presided and introduced the speakers. Mr. Capen also introduced H. I. Cramer, chairman of the Division of Rubber Chemistry, A. C. S., who gave further details regarding the meeting in Boston of the Division on May 23 through 25, and James C. Walton, Boston Woven Hose & Rubber Co., chairman of the local committee on arrangements for that meeting, who discussed these matters also. Mr. Walton pointed out that attendance at two of the special events planned in connection with the Division meeting, the clambake on the evening of May 23 and the plant inspection trips on the afternoon of May 24, would, of necessity, be limited to 500 in the first case and 350 in the second.

Donald D. Wright, Hood Rubber Co., a member of the new liaison committee of the Rubber Division, headed by Chairman-Elect F. W. Stavely, Firestone Tire & Rubber Co., spoke briefly on the work this committee is doing in coordinating Rubber Division and local rubber group activities and pointed out the advantages of membership in the Division.

Mr. Chase gave a general discussion, accompanied by slides, showing a number of machines made by Farrel-Birmingham for the rubber and the plastics industries. It was apparent, from a review of these latest units, that the speeds, production and horsepower requirements are being increased, and greater attention is being paid to reduction of wear and maintenance. Many of the latest designed units are being driven through universal spindles so that all the gears are mounted in rugged gear cases and, therefore, are not affected by bending action and heat in the working members.

The importance of gage control for calendering was also stressed with the showing of the crossed axis Z-type calender and various designs of special calenders having rolls up to 48 inches in diameter to overcome roll deflection. Sheeting of excellent uniformity in a range of gage between 0.004- and 0.020-inch is being made on these Z-type calenders, it was said.

Screw-type machines, for the continuous handling of certain types of plastics, are also being developed in the larger sizes. These as yet do not have universal use, but are well adapted for particular products.

Another trend is toward elimination of mills in conjunction with Banbury mixers. Several types of extruders, strainers, and pelletizers have been developed to handle batches discharged from the Banbury mixer, resulting in labor savings, greater cleanliness, and more uniform products, Mr. Chase said.

Dr. Thiessen first pointed out that the two World Wars brought about raw materials conditions which were very advantageous to the plastics industry and greatly speeded up its growth. First was the availability of a large volume of inexpensive synthetic phenol at the end of World War I; while World War II saw the construction of immense facilities for styrene manufacture.

The most important plastics and synthetic resins, cellulose plastics, phenolics, alkyds, acrylic polymers, vinyl polymers, polystyrene, nylon, etc., were listed together with the major chemicals required for their manufacture. It was pointed out that these chemicals come from the coal carbonization, petroleum, heavy chemicals, and the agriculture industries. One of these chemicals, synthetic phenol, is produced today at a rate more than ten times greater than that of the production of natural phenol which is at its practical maximum. Cresols, on the other hand, are limited by the amount available in coke oven tar plus the relatively smaller amount recovered by the petroleum industry, since it has not so far been possible to synthesize the cresols at prices competitive with the cost of natural cresols or with phenol. If coal hydrogenation becomes even a small factor in our liquid fuel supply, however, the quantities of tar acids available will be of an entirely different magnitude than we have today, Dr. Thiessen declared.

Formaldehyde from synthetic methanol is now in ample supply as a result of the conversion of wartime synthetic ammonia plants to the production of methanol. With urea of increasing interest as a fertilizer and as a cattle food adjunct, a large volume of production of this chemical should be available from which the plastics industry can draw.

Styrene monomer and phenol account for the major portion of the 170 million gallons of benzene a year available now in the United States. Barring any major change in GR-S production upward, the benzene supply situation is now easy.

Ethylene and its close relatives—propylene and acetylene—have grown in importance to the extent that they now far outshadow the coal carbonization raw materials in volume and value of products made from them. In versatility and number of products, the coal tar chemicals still hold supremacy. In this connection there should be no practical limit to the availability of polyethylene.

Vinyl resins are also tied to the key raw material, ethylene, but there is an additional limiting factor, that of the supply of plasticizers. The critical materials in the case of plasticizers are cresols and phthalic anhydride. The plasticizer manufacturer has to compete with the alkyd resin manufacturer for phthalic anhydride, but since the former can afford to pay a higher price, there should always be ample supplies of phthalate ester plasticizers at a reasonable price.

Dr. Thiessen concluded his talk with a short discussion of cellulose plastics and alkyd resins.

The next meeting of the Boston Group will be the annual summer outing, to be held at the United Shoe Country Club, Beverly, Mass., on Friday, June 24.

New York Hears Irby and Doner

THE New York Rubber Group held its spring meeting on March 25 at the Henry Hudson Hotel, New York, N. Y. Approximately 325 members and guests attended the afternoon technical session, which featured a talk on "Silicone Rubber," by George S. Irby, Jr., General Electric Co., and a paper on "Conductive Rubbers," by Sherman R. Doner, Manhattan Rubber Division, Raybestos-Manhattan, Inc. The technical session was followed by a cocktail hour, dinner, and program of entertainment, attended by 288 members and guests. During dinner, Chairman Peter P. Murawski, E. I. du Pont de Nemours & Co., Inc., announced that the Group's annual summer outing will take place on June 16 at Doerr's Grove, Milburn, N. J.

Using slides to illustrate his talk, Mr. Irby began with a review of silicone chemistry. Silicone gum is now available to industry in two principal types: one a relatively firm brown gum which produces compounds suitable for extrusion; and the other a white, tacky, very soft gum which gives compounds that have better flow properties and are superior for molding purposes. Typical formulations of both gums were discussed, and the effect of different fillers was shown on slides. Silicone rubber is vulcanized by organic peroxides by means of a free radical reaction. Benzoyl peroxide is the preferred vulcanizing agent; two parts per 100 parts gum are recommended. The curing period after molding was discussed, and slides were shown to illustrate the effect of this curing on properties. Mr. Irby concluded with a discussion of silicone rubber properties, emphasizing that surface hardness remains constant over a temperature range of 60 to 200° C.

Mr. Doner stated that conductive rubber was made possible originally by the development of acetylene black some 10 years ago, although since that time many channel and furnace-type blacks have been produced with varying degrees of conductivity. Rubber conductivity is believed to be dependent on a continuous carbon to carbon particle contact throughout the mass. Proof of this theory is given by the decrease in conductivity of a piece of stretched conductive rubber, and the fact that poorer black dispersion means better rubber conductivity. All types of natural and synthetic rubber can be made conductive although physical properties are limited by the fact that relatively high loadings of conductive black are necessary. The principal application of conductive rubber is in the dissipation of static charges from vehicles, machinery, etc., and as such is used in munition plant flooring; tires; V-belts and flat transmission belting; sandblast hose; shielding for electric cables; radar applications; and radiant heating panels. Work by an SAE-ASTM subcommittee has resulted in a tentative test for rubber conductivity using laboratory test slabs, but no method is yet available for testing finished products. Mr. Doner concluded his talk with a demonstration of conductive rubber where various rubber parts, when placed across electrodes, conducted enough electricity to permit a two-watt neon bulb to glow.

New Chemical

ISOVALERALDEHYDE, a chemical hitherto available only in pilot-plant quantities, is now in commercial production by Millmaster Chemical Co., New York, N. Y. The chemical has many suggested uses in the manufacture of synthetic resins, pharmaceuticals, as a rubber accelerator, and as a starting compound in organic synthesis. Produced at the company's Berkeley Heights, N. J., plant isovaleraldehyde has a boiling point of 92-93° C.; specific gravity, 0.785; normal density at 20° C., 1.390; and is slightly soluble in water and miscible with organic solvents.

Electrical Engineering Conference

THE Subcommittee on Rubber and Plastics Industries, American Institute of Electrical Engineers, will hold its second conference on electrical engineering problems in the rubber and plastics industries on April 26 in the Hotel Portage, Akron, O. The program will include technical sessions and a luncheon and is open to non-members of the Society.

Conference papers to be presented follow: "Motor Requirements for Rubber Mill Drives," R. S. Ferguson, Goodyear Tire & Rubber Co.; "Motor Drives for Banbury Mixers," C. F. Schnuck, Farrel-Birmingham Co.; "The Application of Electric Motor Drives to Rubber Mills," W. S. Watkins, Ohio Rubber Co.; "Motor Drives for Calenders," V. O. Johnson, United States Rubber Co.; "Motor Requirements for Tuber Drives," D. J. Rose, Firestone Tire & Rubber Co.; "History of Joint Industry Conference Electrical Standards for Industrial Equipment," L. A. Danse, General Motors Corp.; "Joint Industry Conference Electrical Standards for Industrial Equipment (Viewed by a Rubber Machinery Manufacturer)," T. C. Jones, National Rubber Machinery Corp.; "Joint Industry Conference Standards for Industry Equipment (the User's Viewpoint)," L. J. Willmott, Willmott Electrical Co.; "Joint Industry Conference Standards for Industrial Equipment (the User's Viewpoint)," F. L. Swanson, United States Rubber Co.; and "Preventive Maintenance of Rotating Equipment in a Rubber Plant," T. F. Duffy, United States Rubber Co.

Tubeless Tire Discussed

THE Detroit Rubber & Plastic Group held a dinner-meeting March 11 at the Detroit Leland Hotel, Detroit, Mich. Approximately 200 members and guests heard Frank Herzegh, tire engineer, The B. F. Goodrich Co., speak on the "Goodrich Puncture-Sealing Tubeless Tire."

Illustrating his talk with charts and a sound film, Mr. Herzegh described the history and the development of the tubeless tire, showing how the problems of air leakage, constructional strength, etc., were overcome. The speaker summarized the distinctive features of the puncture-sealing tubeless tire as including (1) a thin, effective barrier against diffusion of air into the tire body; (2) a slight bead shape modification to provide a simple means of sealing the tire on a standard drop center rim; (3) a layer of puncture-sealing material in the crown area; (4) a high-strength rayon cord body to combine bruise resistance with thin crown gage for cool operation at high speed; and (5) greatly reduced blowout hazard inherent with integral body liner construction.

The Group's next meeting, on May 6 at the Detroit Leland Hotel, will feature a talk on "Silicone Rubbers" by William Wizard, Dow Chemical Co.

Readi-Sol, New Metal Cleaner

READI-SOL, a new improved all-purpose metal cleaner, has been announced by Preventive Maintenance Co., manufacturer of Rubber-Flo mold lubricant, 1997 Fairfield Ave., Bridgeport, Conn. The new material, it is claimed, is an ideal cleaning fluid which can be applied by spray or brush and works effectively on all metal parts. Since it emulsifies with water, Readi-Sol is especially suited for removing grease and oil from cement floors. For such application the new product is spread on the cement and flushed off with water, carrying away the oil and grease with it. Readi-Sol is non-toxic and will not affect the metal in any way. The new cleaner is also usable in all types of plants and for every kind of cleaning job when grease or oil is the problem.

Washington Group Hears Semon

WALDO L. SEMON, director of pioneering research for The B. F. Goodrich Co., was the featured speaker at the meeting of the Washington Rubber Group on March 3 at the Cosmos Club, Washington, D. C.

Speaking on "New Products from Research," Dr. Semon devoted his talk mainly to "cold rubber," which, he said, may mean future employment for thousands of production workers.

"Increasing use of the new material may be the factor that will permit competitive economic operation of the American chemical rubber plants with the associated employment of thousands."

The final word on synthetic rubber has not yet been told, said Dr. Semon, who also predicted that great strides still are to be made in the manufacture of new and improved varieties of synthetic rubber. Warning that research in this country may soon face a serious obstacle, the speaker pointed out that industry is finding it increasingly difficult to raise capital for the commercialization of the many advances coming from research. Industry must be given a period of time in which to recover its expenditures for research and development.

Color Computer

THE General Aniline-Librascope Tristimulus Integrator, a machine said to be so precise that it can distinguish more than 100,000,000 colors, and within a few moments give the answer to a series of computations involving integral calculus, has been developed by General Aniline & Film Corp., and Librascope, Inc. Invented by H. R. Davidson, of General Aniline, and engineered by L. W. Imm, of Librascope, the machine integrates continuously over all portions of the visible spectrum and will tell immediately whether a given color will match another color, and, if not the device will describe the difference between the colors.

Although color differences cannot be properly described in words, color scientists have developed an internationally accepted mathematical procedure for obtaining numbers which unambiguously specify any color. This procedure may require hours of calculation, but the integrator, an electronically controlled ball and disk mechanism connected directly to the spectrophotometer, gives the correct result in an instant, it is claimed. Together, the recording spectrophotometer and the Tristimulus Integrator not only measure and analyze the color in 2½ minutes, but also give a numerical value of hitherto unobtainable accuracy, it is further stated.

Form Technical Latex Committee

REPRESENTATIVES of the producers of natural rubber latex met recently to form a permanent organization known as the Technical Committee of Natural Latex Producers. The committee was formed to consider any technical matters of interest to the industry and to assist in maintaining and improving the quality of natural latex.

Membership consists of representatives of the following companies: General Latex & Chemical Corp.; Goodyear Tire & Rubber Co.; Firestone Tire & Rubber Co. and Xylos Rubber Co.; H. A. Astlett & Co.; Dunlop Rubber Co. (Charles T. Wilson & Co., Inc., agent); Revertex Corp. of America; Latex Distributors, Inc.; and United States Rubber Co. and its Naugatuck Chemical Division. E. M. McColm, U. S. Rubber, was elected chairman; W. T. L. Ten Broeck, Goodyear, vice chairman.

The committee will meet from time to time to consider any technical matters which may require industry-wide collaboration. Emphasis is placed on defining standards of quality and maintaining them at the highest level compatible with present production methods. It is hoped that such collaborative effort will result in the establishment and general acceptance of standards which indicate the technical usefulness of the commodity rather than the artificial standards based on appearance now used in the dry rubber market.

New Aromatic Chemical

COFFEE-Captan, a new heterocyclic aromatic chemical, has been announced by Cargille Scientific, Inc., New York, N. Y. Consisting of alpha-furfuryl mercaptan, one of the essential ingredients of the aroma of roasted coffee, this new synthetic is of interest for application as a polymerization agent and vulcanization accelerator intermediate for rubber, and in solvents, aromatics, and masking agents.

The chemical is supplied as a water-white liquid having a specific gravity of 1.132 and a boiling point of 55-57° C. and 17mm. pressure. The liquid, it is claimed, will not discolor, polymerize, or oxidize upon standing, is completely miscible with most organic liquids, and can be diluted with solvents and fixatives.

Isopropyl Phenols

COMMERCIAL quantities of isopropyl phenols are now being offered by Koppers Co., Inc., Pittsburgh 19, Pa. Produced at the company's Oil City, Pa., plant, the isopropyl phenols are offered in three grades: ortho-isopropyl phenol, a relatively pure ortho isomer; meta,para-isopropyl phenol, a close-boiling mixture of the meta and para isomers; and diisopropyl phenol, a mixture of the dialkylated phenols. The chemical reactivity of these compounds is typical of the lower mono-alkyl phenols. Phosphate esters can be prepared by reaction with phosphorus oxychloride.

Although previously available only in research quantities, the isopropyl phenols already have been found to have several promising uses. The phosphate esters offer promise as plasticizers for vinyl resins and related materials. The isopropyl phenols have also been suggested for use in the production of rubber processing chemicals.

NEWS of the MONTH

Litchfield Emphasizes Value of Synthetic Rubber as Price Stabilizer; Collyer Asks for Improved Business-Government Relation

P. W. Litchfield, chairman of the board, Goodyear Tire & Rubber Co., pointed out during March that the American synthetic rubber industry because of its influence in stabilizing the rubber market had saved the consumers of rubber products in the United States about two billion dollars between April 1, 1947, and January 1, 1949. John L. Collyer, president, The B. F. Goodrich Co., expressed much concern regarding the continued worsening of relations between business and government. He added that the conflict of views as to government's role in our economy makes it imperative that a criterion be found and presented to the American people in a way that will resolve the controversy and restore confidence. John P. Coe, vice president, United States Rubber Co., stated that as a new chemical manufacturing industry, synthetic rubber appears well on the way to success and that the expense of the development of "cold rubber" seems justified and should be vigorously continued. The discussions at Rubber Study Group meeting in London during the week of March 28 are expected to have considerable influence on the future of the world's rubber industry. Consumption of new rubber in the U. S .A. in February was 7% below that of the previous month. The 1949 wage and pension demands of the URWA union will first be presented to Goodrich since the contract there may be reopened on May 23. Rubber industry management and labor representatives presented their views on new labor legislation before the House Committee on Education and Labor during March.

Litchfield on Rubber Price Stability

In another one of his pamphlets under the general heading of "Notes on America's Rubber Industry," Mr. Litchfield discusses the practical benefits of our synthetic rubber industry in that it may be credited with saving American consumers of rubber products two billion dollars since April 1, 1947. The title of the pamphlet is "Saved: $2,000,000,000—Practical Benefits of Rubber Price Stability."

Mr. Litchfield first points out that based upon almost 50 years of close experience with the international rubber market, it is his considered opinion that American users of tires and other rubber products have been saving one hundred million dollars every month because we have a synthetic rubber industry, and that this saving has reached a total of at least two billion dollars since April 1, 1947, when the government abandoned its controls of natural rubber and permitted a free market.

Natural rubber available to this country from April 1, 1947, until January 1, 1949, was about 1,250,000 long tons. Total new rubber used, however, was 1,900,000 long tons, of which 840,000 long tons were synthetic rubber. Without synthetic rubber there would have been an acute shortage of new rubber, and, it was emphasized, this shortage would have excited active bidding for the available supply, and the price would have shot up to $1 a pound or more as against the current price of 19¢.

A comparison of the range of natural rubber prices over the three decades since World War I was then given to show how this present price stability with its attendant saving of two billion dollars compared with the wide fluctuations in price during those periods. It was indicated that the rubber goods industry has solved its basic raw material problem by the use of synthetic rubber as a price stabilizer against wide variations in the price of natural rubber. In addition, with the assurance of adequate supplies at a reasonable price, rubber goods manufacturers are now able to expand production and develop new markets in fields previously dominated by other raw materials such as leather, metals, and textiles.

In considering what might have happened to our economy if we had no synthetic rubber industry after the late war, Mr. Litchfield states that manufacturers, consumers, and employes all would have felt the burden of higher prices. Increased working capital would have been necessary for the entire rubber industry. Interest charges and factory and distribution overheads would have increased. The industry would have been forced to operate at reduced capacity instead of enjoying full capacity and employment during this period. This state of affairs would not have been all, he added; a severe black market would have existed due to the acute shortage of tires and other rubber products, resulting in still higher prices. Even at a price of $1 a pound little, if any, additional natural rubber would have been produced because there just was not any more available, it was said.

What has actually happened since the end of the war has been a gradual increase in the supply and the use of natural rubber, with supply and demand flexibly balanced by drawing on our synthetic rubber production. While temporary fluctuations have occurred in the price of natural rubber, the overall effect has been a new degree of price stability—to the benefit of industry and consumer alike. As a result, few major industries in the period of postwar inflation have been able to provide so much value for so many people as the rubber industry. A tire is one of the few commodities still in the prewar price range, along with razor blades, aspirin, and coke. Almost everything else we buy costs 25 to 200% more, Mr. Litchfield said.

Included in this pamphlet was a very interesting table headed "Rubber Consumption as a Yardstick," in which it was stated that rubber consumption is a good yardstick to measure the relative standard of living of peoples of various countries, just as steel production, automobiles per capita, telephones per capita, are good barometers. The consumption table follows:

New Rubber Consumption per Capita

	Pounds
U.S.A.—50 years ago	9/10
Balance of the world—today	9/10
U.S.A.—1929	8½
U.S.A.—today	17
Canada—today	11
England—today	8
Russia—today	1½

In conclusion, Mr. Litchfield emphasized that in view of this remarkable performance, in view of the continued shortage of natural rubber, and, particularly in view of unsettled world conditions, American rubber policy should be:

"Keep 600,000 tons of general-purpose synthetic rubber plant capacity in standby condition, ready for any emergency and keep at least 150,000 tons of this capacity in constant production not only because it is required by market conditions, but also because it will enable an ever-growing fund of production know-how for the nation."

Collyer on Business-Government Relation

Mr. Collyer gave a talk before the Economic Club of New York, on March 10, on the subject, "How Can We Improve the Relation between Business and Government?"

"What should we do—what can we do—about the relations between business and government?" asked Mr. Collyer. "Are we going to permit them to deteriorate until it is too late to salvage the principles that have meant so much to the American people? Or are we going to find constructive solutions that will promote sound material progress and individual liberty?"

Mr. Collyer pointed out that the major challenge that we face has to do with the manner in which our American economy shall function in the future. No American can afford to be indifferent to this challenge. Whether he is engaged in agriculture, industry, trade, or the services and professions, he is in business, for business has to do with how he makes his living. The future equilibrium between business and government will affect him whether he be a minister or an executive, a tire builder or a farmer.

It was indicated that this future equilibrium should continue to rest upon certain fundamental principles which are our heritage and in which we all believe, i.e., that the freedoms we enjoy are our most priceless heritage, that the door of opportunity should be open to all, and that competition and incentives are necessary to progress; also, that a stable government should provide the rules by which we live together; that it should provide recourse against abuses within, and safety from dangers without, and that ours should be a government of laws, not men.

Mr. Collyer called on government to be more consistent in its activities, to base its decisions and actions on objective and impartial consideration of facts, and to show by these acts its understanding that the unparalleled success of our economy and of our people flows from the primary motivation of personal gain.

Government can improve the relation with business by its concern with conditions that help or retard business activity, recognizing that the financial support of government is wholly dependent upon the income of the people.

We must face the question, Mr. Collyer said, of whether the American economy can carry existing, or even greater financial burdens, without the force of compulsion replacing the freedoms that we cherish so highly. In 1949 our government at national, state, and local levels is taking approximately $60,000,000,000 of our total income

estimated at $215,000,000,000, or 28¢ out of each dollar.

We are carrying heavy domestic burdens, and we are still rendering a large measure of financial aid to the governments of many other nations, including some that are traveling the road to socialism and, probably, through socialism, to totalitarianism. At what point do these burdens, domestic and foreign, become so intolerable that we suffer the loss of incentives, opportunity, and our enviable standard of living, Mr. Collyer asked.

Already capital markets are listless, and income after taxes has become the main source of venture capital. A decline of business activity of just a few percentage points—even with present tax rates—would dry up this last remaining source.

The material progress of any nation is directly related to the amount of capital utilized in the production of goods. Today American industry has less physical capital per employe than in either 1929 or 1939. The sharing of poverty will be the inevitable end if the conditions which have brought on this alarming situation should continue. Government has the responsibility to revise those policies and laws which now are preventing adequate provision of private capital, it was added.

The relation of government and business is a two-way responsibility, however, and businessmen should take greater initiative in establishing channels of contact and communication so that they may assume their full share of the responsibility, it was emphasized. If politicians take positions which, from the view of business, are not sound or constructive, the fault may be with business. Business should, however, not deal with government on the narrow base of special interest and should take the broader view and concern itself with the interests of the American people in dealing with government, it was suggested. Narrow interests gain emphasis over public interest, and government assistance is substituted for self-reliance. An unhealthy intimacy is developed that encourages further favor seeking and more dependence upon government. It is his personal conviction that we have reached or passed a danger signal warning that the intimacy between government and business is already too close, Mr. Collyer said.

It was stressed that in order to improve the relation between business and government businessmen should set aside a certain percentage of their time to present to government facts and more facts—remembering that persistence and courage in presenting views are often required.

The conflict of views as to government's role in our economy requires that a criterion be found and presented to the American people in a way that will resolve the controversy and restore confidence. The Hoover Commission Report on how to obtain efficiency in the vast executive branch of our federal government may solve a most important problem that was attacked on a non-political basis, and Mr. Collyer suggests that this approach holds great promise of developing the criterion we need to determine what can wisely and safely be the role of government in our economy.

We do not lack opinions on the virtues and evils of greater power in the hands of government, but what we do not have, and need desperately, is fact-finding by competent and unbiased men of unimpeachable integrity that will set for us the warning signals that we must recognize and heed if we are to preserve our freedoms.

"It is with the utmost sincerity that I recommend that the 81st Congress embark on such a non-political undertaking, with a clear statement of national policy that is focused on the preservation of the freedoms of the American people," Mr. Collyer said.

The essential ingredient of an improved relation between business and government is the certainty that in the United States of America we will not compromise freedom. Every minute that passes until such certainty is established is not only breeding distrust and conflict; it is another minute ticked off on the clock that may be marking our passage, also, into the domain of drudgery from which no people who once had their freedoms have yet returned, Mr. Collyer concluded.

Synthetic Rubber Developments

Mr. Coe, according to an interview reported in the *New York Journal of Commerce* for March 16, has stated that the new low temperature GR-S is not only expected to improve the wearability of tires and other rubber products, but should stabilize the future of the synthetic rubber business and improve its financial outlook. Viewed as a commercial chemical development, "cold rubber" is a new product being added to the line of existing manufacturing chemical business. The existing business is that of GR-S, the general-purpose rubber produced by the RFC's Office of Rubber Reserve.

By the Summer of 1949 it is expected that the "cold rubber" production capacity will be built up to the authorized 183,000 tons a year. Final evaluation by the consumer is anticipated by the Summer of 1950, and possible success in 1950 or 1951 was predicted. The March production rate was 20,000 long tons a year; it is estimated that production in 1949 will total 80,000 tons and perhaps 200,000 tons in 1950.

During 1948 it is understood Rubber Reserve made an operating profit of 6.2% on sales, after setting aside reserves for depreciation at commercial rates and before return on borrowed capital. Such return was paid in the form of interest. However, assuming a return was paid after 38% income tax, the net available for dividends would have been approximately 3.8% of sales, or approximately 2.5% of the capital actively employed in the business, it was said. This capital includes working capital plus all facilities in use, but not facilities being held in standby for reasons of national security, it was added.

The amount of profit on sales in some businesses would be considered adequate. The rates of return on capital would appear to be low as an attraction to investors on an ordinary business basis; however, the business is still relatively young, and there are possibilities for the future in the direction of more rapid turnover of the investment. The successful completion of the "cold rubber" development offers promise in the direction of stabilizing demand for the product and increasing the profit potentialities, Mr. Coe declared.

As a matter of fact the investment in plants has already been made, and although investment was made for war purposes, it is being amortized and is showing a moderate return on the investment. The expense of the development of "cold rubber" would appear to be well justified on a commercial basis and should be vigorously prosecuted, Mr. Coe concluded.

Other comments on synthetic rubber developments, citing anonymous research directors and chemists, stressed further new rubbers for tire sidewalls, hose and belting, footwear, etc., and emphasized the trend toward specialization in synthetic rubbers. The General Tire & Rubber Co. has mentioned a new Jet CM rubber in announcements in connection with its Squeegee passenger-car tires.

A report from Washington early in March indicated that the price of GR-S will remain at its present level of 18½¢ a pound despite the fact that natural rubber has been sold as low as 18⅜¢ a pound in the recent past. G. B. Hadlock, ORR director, stated that the cost of producing GR-S does not warrant any reduction in its price at this time, regardless of what happens to the price of natural rubber.

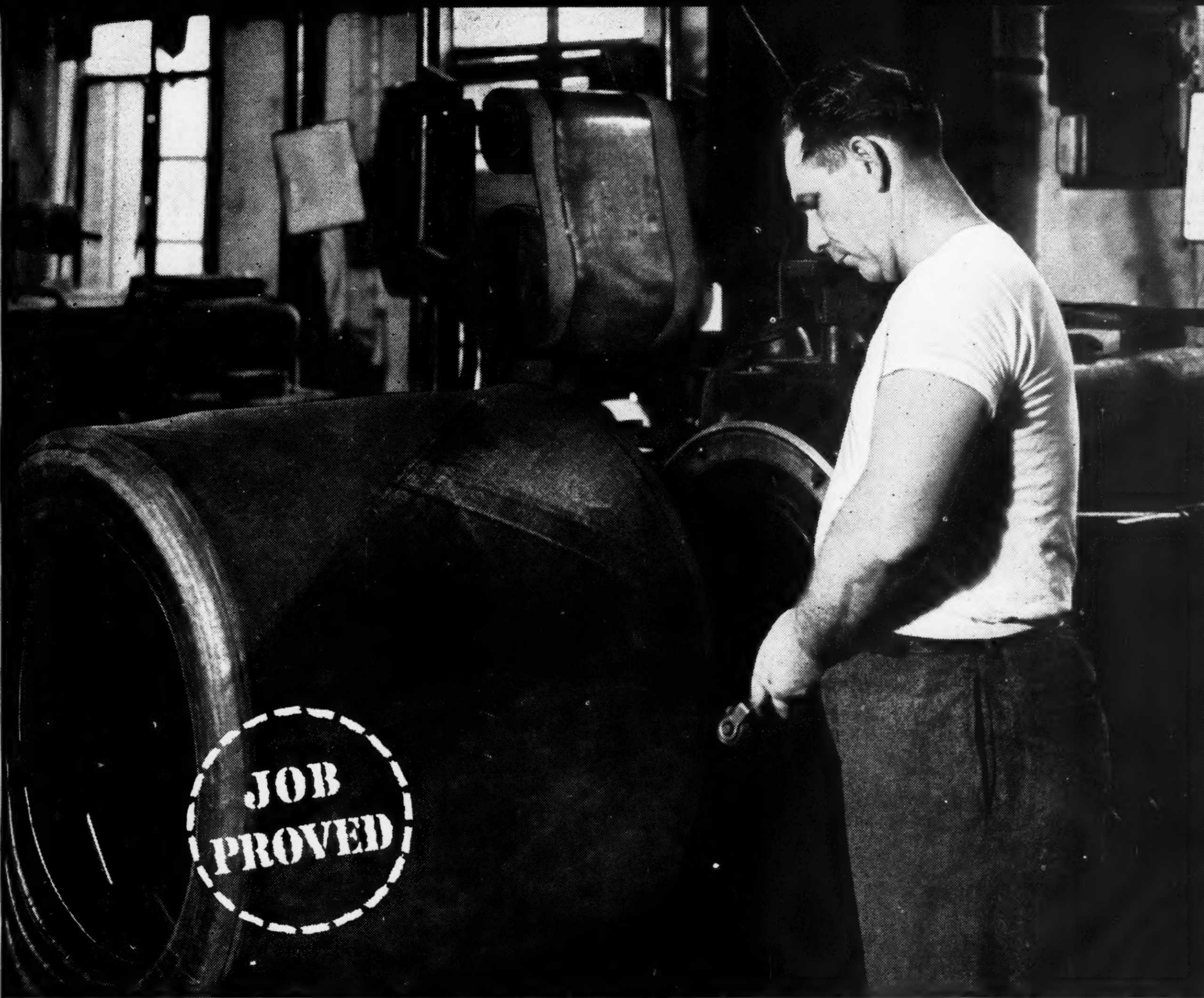
The Rubber Study Group Meeting

Although no statement could be obtained from the State Department regarding the Rubber Study Group meeting scheduled for London, England, the week of March 28, the probable make-up of the American delegation follows: D. D. Kennedy, State Department, delegate; advisers, George Alexander, State Department; E. G. Holt, W. C. Overley, Department of Commerce; Fred Bates, Army-Navy Munitions Board; Mr. Hadlock; Mr. Litchfield; Mr. Collyer; Harvey Firestone, Jr., Firestone Tire & Rubber Co.; Geo. H. Tisdale, U. S. Rubber; Thomas Robins, Jr., Hewitt-Robins, Inc.; G. K. Trimble, Midwest Rubber Reclaiming Co.; A. L. Viles, The Rubber Manufacturers Association, Inc.; and R. D. Young, Rubber Trade Association.

Lockwood's *Rubber Report* for March 15 makes the point that these Study Group meetings have far deeper significance than the complex statistical calculations which emerge in the final press release, or even the complete statistical compilations which are carried home in the brief cases of the aides to the advisers to the delegates. What is actually being dealt with is the future fate of the most important commodity in the field of international commerce and a commodity vital to the national security of the worlds on both sides of the Iron Curtain, it was said.

Lockwood's *Report* does not see a serious excess of production over consumption for natural rubber in 1949; nor does it think that production restriction will solve the problem of over-production of natural rubber. It was suggested, however, that with the kind of brainpower and potential leadership gathered at the Study Group meeting the problems of the worldwide rubber industry, i.e., for the rubber goods manufacturer, an ample supply of stably priced raw material; for the rubber producer, a remunerative price in relation to his expanding cost; for the United States Government, national security in rubber; and for the governments of the rubber producing countries, dollars to rebuild strong and free economies; should certainly be capable of solution.

A report from London on March 3, attributed to E. N. Bradley, chairman of the Rubber Trade Association of London, stated that some form of restriction scheme for natural rubber is inevitable unless some agreement is reached with the United States for the reduced use of synthetic rubber. He based his view on the fact that under prevailing conditions there is likely to be a large surplus of natural rubber over the next few years. The view of the trade that this will be the case, he said, is clearly shown by the fact that almost alone among commodities rubber is very little dearer in price than prewar, while the anomaly continues, month after month, of a premium on spot over forward prices. It was added that the rubber trade is closely watching the move now being made to secure a world tin agreement for the stability of that industry. It is felt that much the same circumstances apply to natural rubber as to tin, this report stated.



SAVING $4,800 A YEAR WITH CIRCOSOL-2XH

Sun Rubber-Processing Aid Eliminates Extra Cementing Operation in Tire Plant

A manufacturer was using a mixture of 50 percent GR-S and 50 percent natural rubber for automobile, truck, and airplane tires. Pine oil and an ordinary type of processing oil were being added as plasticizers. This combination of oils affected the tack of the stock to such an extent that the various plies had to be cemented together in building up the carcass. Sheets often wrinkled in processing and had to be discarded.

A Sun Engineer was consulted. After studying the operation, he recommended Circosol-2XH—a rubber-processing aid developed by Sun for use with GR-S.

Following the introduction of Circosol-2XH the tack induced by processing was not destroyed, and the cementing operations were no longer necessary. Sheets no longer wrinkled. Waste was reduced. Savings in labor alone amounted to some $400 a month.

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"Belt" Railroad Developments

Two major industries, steel and railroads, are taking opposite sides in connection with the projected $210 million, 130 mile "belt" railroad planned between Lorain and East Liverpool, O., by the Riverlake Belt Conveyor Lines, Inc., a subsidiary of the Akron, Canton & Youngstown Railroad Co. This project was explained in some detail in our March issue.

Twelve railroads operating main lines in Ohio are joined with the rail brotherhoods in bitter opposition to the proposed two-way belt line which would haul coal north and carry iron ore south across the State of Ohio. Proponents of the project already have been heard at one session of the Judiciary Committee of the Ohio Legislature. The Mahoning Industrial Council, representing several steel companies urged passage of the bill, which would give Riverlake Belt the right to acquire the power of eminent domain in order to obtain the property on which to build the conveyer system.

Charles M. White, president of the Republic Steel Corp., has said that the belt system "appears to be a sound engineering plan."

"In my opinion," he added, "the proposed conveyer should be given a great deal of consideration and study. If such study supports the claims of those proposing the idea, then I believe it should have the backing of everyone who wants to see the standard of living in our country continue to improve.

"Either a canal or the conveyer will hurt some railroads temporarily, but it has been the experience of this country that each new advancement in science or industry ultimately reacts to the overall good.

"If steel and other commodities can be reduced in cost and price," Mr. White added, "more such products will undoubtedly be produced and everyone, including the railroads, will benefit by the increase in the over-all production which would result."

Industry Production and Trends

Manufacturers' shipments of passenger-car tires in January totaled 4,249, 036 units a decline of 1. 5% from December, when the shipments totaled 4,320,195, the RMA reported March 14.

Production of passenger-car tires rose 3.5% to 4,772,116 units, as against 4,609,-669 units in December. As a result of increased production, inventories rose approximately 6% to 9,319,292.

Shipments of truck and bus tires in January were down 7.7% to 1,036,367 such tires from 1,122,331 in December. Production was up 1.7% to 1,123,820 units, compared to 1,105,386 the month before, and inventories increased to 2,020,154 units from 1,933,1 6 at the end of December.

Shipments of automotive tubes during January were up 4.3% to 4,925 547 units, against 4,722,364 in December. Production was about even with the previous month at 5,062,357 units. The change in inventory was slight with 9,814,837 tubes on hand at the end of January, as compared with 9,734,490 on December 31.

General Cable Corp. announced early in March that prices for its copper building wire and service wire have been cut 5% to 14% in order to meet competitive prices for these products. It is understood that other large makers of both building and service wires also have reduced their prices for these items.

Spokesmen for the wire and cable industry say that the supply of building and service wires is now at least in balance with the demand.

Value of United States exports of rubber and rubber products during January amounted to $11,283,431 compared with $13,314,570 in December and $11,895,435 in January, 1948, the United States Department of Commerce announced on March 18.

Analysis of Bureau of Census figures showed that January exports of synthetic rubber, reclaim, and scrap recorded large increases over shipments in January, 1948, but that exports of mechanical rubber goods declined sharply. Shipments of synthetic rubber were the highest since April, 1948, and those of passenger-car casings the highest since February, 1948.

Exports of transportation items (tires, tubes, camelback, and tire repair materials) represented 63.3% of total January shipments, contrasted with 57.6% in January, 1948, and 59.8% for the year 1948.

Beginning with January, new export classifications were established for pneumatic casings for aircraft, farm tractors and implements, off-the-road use other than fram tractors and implements, bicycles, motorcycles, and industrial uses. Compared with truck and bus tires, or with passenger-car tires, total export value in any of these new classifications is low. In January, 1949, exports of farm tractor and implement tires were valued at $224,222; followed by those for other off-the-road use, at $203,932; aircraft, at $149,808; industrial, $78,033; bicycle, $15,498; and motorcycle, $3,228, the Rubber Division of the Office of Domestic Commerce reported.

World production of natural rubber in January is estimated by the Secretariat of the Rubber Study Group at 125,000 long tons, against 132,500 tons in December and 122,500 tons in January, 1948, the Department of Commerce revealed in another report.

World consumption of natural rubber is estimated at 127,500 tons in January, as compared with December, 1948, consumption of 129,500 tons, and that for January, 1948, of 120,000 tons.

World output of synthetic rubber, excluding Russia, is estimated at 42,500 tons in January, compared with 45,500 tons in December, 1948, and 43,500 tons in January, 1948. January consumption is estimated at 40,000 tons, down 500 tons from December, 1948, and down 7,500 tons from January, 1948.

Consumption of new rubber in the United States during February was estimated at 81,598 long tons, according to the RMA on March 25. This was 7% less than the January consumption of 87,756 tons.

Use of natural rubber declined 8.2% during February to 46,140 long tons from 50,246 tons in the previous month. Consumption of synthetic rubber declined less sharply to 35,458 tons from 37,510 tons in January, a reduction of 5.5%.

While the report showed that consumption of natural rubber in February, 1949, was almost 10% less than it was in February, 1948, the use of synthetic rubbers during the month was about 0.25% greater than it was during the same month last year.

By types, synthetic rubber consumption during February, 1949, was as follows: GR-S, 27,343 tons; neoprene, 3,074 tons; Butyl, 4,544 tons, and nitrile types, 497 tons.

Labor Relations News

The United Rubber Workers of America, (CIO), having decided that they would ask for a 25¢-an-hour wage increase and a company-paid pension plan of $100 a month for their members, will first present these demands to the Goodrich Company whose contract with the local union in Akron, O., may be reopened on May 23.

Besides the wage and pension demands, the international policy committee of the URWA recommends that all union officers strive to make the six-hour day standard throughout the industry. The committee also urged local unions to bargain for health and welfare programs and the union shop, and also attempt to eliminate area wage differentials.

L. S. Buckmaster, URWA president, said the 1949 wage program "represents a constructive approach to two of the most pressing problems facing our country, declining purchasing power and insecurity in old age.

"The pension program would enable older workers to leave jobs in the plant and so open new opportunities to young people in the rubber and allied industries," he explained.

"It is hoped that the six-hour day will become prevalent throughout the industry so that many workers who are now unemployed will be put back to work," Mr. Buckmaster added.

The policy committee also passed a resolution asking Congress to adopt President Truman's labor bill and to repeal the Taft-Hartley Law immediately.

Meanwhile Goodrich Vice President J. W. Keener, testifying before the House Committee on Education and Labor, said that he was pleased to know that union officers want management representatives to sign non-Communist affidavits if union representatives must do so.

"This appeal for equality is a just one," Mr. Keener declared, "and it can be sympathetically understood by management people who have asked for equality under the law for more than a decade."

In discussing a new labor law, Mr. Keener emphasized that the specific provisions of a new labor law are of less importance than are the principles upon which the law is based.

"If the approach is one-sided and based on power without responsibility, privilege without obligation, then the great and costly excesses that occurred in Wagner Act days will likely recur.

"If the approach is in terms of protection of fundamental American freedoms, equality of rights and privileges, obligations and responsibilities, and the provision of competent, impartial, administration, then neither management, nor labor, nor employes, nor the public have anything to fear," Mr. Keener stated.

Mr. Buckmaster, in his appearance before the same House Committee, urged immediate scrapping of the Taft-Hartley Law and reenactment of the Wagner Act along with proposed amendments from the administration bill.

The URWA president stressed that he was not attacking the Taft-Hartley Act because rubber workers had suffered from penalties, but rather because the union had been hampered and its work made more difficult by the present law.

"We have experienced the effect of useless restrictions in the attempted organization of unorganized workers, in the actual process of collective bargaining, in the administration of collective bargaining agreements and in the administration of the international and local unions.

"In an economy such as ours free collective bargaining is essential," he declared. "So long as the Taft-Hartley Act remains on the books, free collective bargaining is impossible."

Workers of the country have the feeling that the government is "punishing unions, issuing injunctions against unions and discouraging collective bargaining," Mr. Buckmaster said.

The administration bill undertakes to reestablish the national policy of encouraging collective bargaining. It imposes restrictions on management and labor which do not punish either, but which are designed to handle disputes without interfering with commerce, and Mr. Buckmaster called on Congress to pass the administration bill and "make a monumental contribution to the public welfare."

R-1 Amended

Inner tube manufacturers may now use more natural rubber in the production of popular-size tubes, as the result of an amendment of Allocation Order R-1, issued March 16 by the United States Department of Commerce, Washington, D. C. The change permits a manufacturer to make 40% of his 9.00 cross-section and smaller tubes of natural rubber. The remaining 60% must be manufactured from Butyl. Previously, 80% of a producer's output of popular-size passenger-car and small bus and truck tubes had to be made of Butyl.

The Office of Domestic Commerce said that while the change permits reduction of Butyl use from approximately 60,000 to 40,000 long tons a year, the Department does not expect consumption of the synthetic to decrease materially. Officials explained that acceptance of Butyl by manufacturers and the public promises its continued wide use on a voluntary basis. It is not anticipated that the new tube specifications will interfere with accumulation of natural rubber for the strategic stockpile, they said.

The amendment to R-1 eliminates the certification which importers of rubber products not under specification controls in this country were required to file with Collectors of Customs. Importation of products under specification controls remains prohibited, however, and requests to bring them into this country will continue to be handled as appeals by the ODC rubber division.

Changes at Mansfield

J. S. Wainright has relinquished the post of general sales manager of The Mansfield Tire & Rubber Co., Mansfield, O., which he held for 28 years. He will, however, remain active with the company in a sales advisory capacity and as vice president and director.

Mr. Wainright came to the rubber company in 1916 as a district sales manager and was made general sales manager five years later. His election as vice president took place on April 4, 1946.

Succeeding him as general sales manager is Edward E. Stevens, formerly assistant general sales manager, the position he received four years ago shortly after his return as a lieutenant commander from 3½ years of service with our Navy. Mr. Stephens, who has also been assistant treasurer of the company for the past three years, before joining Mansfield had been associated with the newspaper industry in the editorial and sales fields.

EAST

Affiliated Photo—Conway

Palmer J. Lathrop

Cameron Machine Co., 61 Poplar St., Brooklyn 2, N. Y., manufacturer of Camachine slitting and roll-winding machinery for the paper, textile, and rubber industries, has elected Palmer Jadwin Lathrop executive vice president. Mr. Lathrop, associated with Cameron since September, 1948, was formerly vice president in charge of production for the Bristol-Myers Co. During the war he served with the U.S.A.F. in the Alaskan Division of the Air Transport Command.

Record Toy Fair

The forty-sixth annual American Toy Fair, by far the largest in the show's history, was held in New York, N. Y., on March 7 to 18. More than 100,000 different toys were displayed by 1,200 companies in exhibits covering eight floors in the Hotel McAlpin, five floors in the Hotel New Yorker, and in permanent showrooms at 200 Fifth Ave., 1107 Broadway, and other locations. Attended by approximately 10,000 buyers, the Fair was featured by a record number of new items, a shift in price emphasis to the medium and low priced goods, and a return to the prewar seasonal pattern of buying. Prices on many items either decreased by about 10%, or held to last year's levels while giving increased quality, and manufacturers reported no shortages in materials.

As in previous years, rubber was very much in evidence, appearing in some application in almost every exhibit. Among the rubber company displays balloons and latex crib toys were plentiful and in almost endless variety of shapes, colors, and sizes. In addition to increased variety, a noticeable feature of balloon exhibits was the almost universal adoption of packaging and the packing of balloon sets of different types.

The Auburn Rubber Co. display of rubber farm toys, balls, and wheel toys featured a renewed trend toward boxed assortments. Bayshore Industries, Inc., displayed its new "Jolly-Jingle-Joys" toys, vinyl party costume sets, and "Firecracker" balloons besides its variegated line of balloons. Dewey & Almy Chemical Co. exhibited its new crib toys, giant balloons, and non-sinkable rubber decoy ducks. A full line of rubber quoits, horseshoes, and exercise sets was shown by Martin Rubber Co., Inc. In addition to its standard crib toys, Molded Latex Products, Inc., featured the new "Howdy Doody" puppet and "Kay-spray" atomizers. Full lines of balloons and rubber noisemakers were shown by National Latex Products Co. Regent Rubber Creators, Inc., featured an arresting display of latex masks and store display items of startling realism.

Seamless Rubber Co. showed its new bathing caps and swim accessories; while the Sun Rubber Co. display of rubber toys, dolls, and balls featured the new "Amosandra" doll and the use of new voices in the Disney toys. New series of dog and elephant latex squeeze toys were displayed by Tillotson Rubber Co., Inc., besides balloons and other crib toys. Among the other rubber company exhibits, displays of balloons appeared by Anderson Rubber Co., Maple City Rubber Co., and Van Dam Rubber Co., Inc. Rubber balls of different types were shown by Midland Rubber Co., Pennsylvania Rubber Co., and W. J. Voit Rubber Corp. Rubber balls, balloons, toys, and dolls were displayed by Barr Rubber Products Co., Eagle Rubber Co., Inc., Eastern Rubber Specialties Co., Gem Rubber Corp., Oak Rubber Co., Ryan Rubber Co., Seiberling Latex Products Co., and Topstone Rubber Toys Co., Inc.

In the field of inflatable vinyls, Bespar Products Corp. had new swim mitts and all-purpose cushions, and a full line of giant inflatables was shown by Doughboy Industries, Inc. Plastictronics, Inc., exhibited its "Holiday Line" of inflatables including new roly-poly toys and wading pool. New items shown by Plastite, Inc., included vinyl flying blimps, combination books and toys, playballs, and beach bags. The display of beach balls and toys shown by Plextron, Inc., featured the new plastic "Bobble Boat." A sturdy new vinyl wading pool and full lines of inflatable surf mats, cushions, and playballs were shown by U. S. Fiber & Plastics Corp. Other exhibitors of inflatable vinyl balls, beach toys, crib toys, etc., included Kestral Corp., Transplastic, Inc., and Vinseal, Inc.

Seligman Advanced

H. B. Seligman last month was elected vice president of Continental Carbon Co. and of Witco Carbon Co., both of 295 Madison Ave., New York 17, N. Y., and also a director of the latter company.

In addition, Max A. Minnig and John H. Wishnick have been elected to the Witco Carbon board.

Mr. Seligman was formerly treasurer of Witco Chemical Co. and stationed in New York, but is now in Amarillo, Tex., where the offices of both companies are located. He is registered as a certified public accountant in both Illinois and Texas.

Mr. Minnig is manager of the gas department of Witco Carbon; while Mr. Wishnick is connected with the engineering division of the company and is located at Amarillo.

New York Quartermaster Office, Department of the Army, recently awarded contracts for raincoats to the following: Plymouth Rubber Co., Rockland, Mass., 37,500 coats, \$195,937; S. Buchsbaum Co., Chicago, Ill., 79,500, \$512,775; Marathon Rubber Products Co., Wausau, Wis., 45,000, \$241,650.

Changes at Southern Alkali

With the retirement of O. N. Stevens as operating vice president of Southern Alkali Corp., several management changes have been announced by Harold F. Pitcairn, president. Southern Alkali, jointly owned by Pittsburgh Plate Glass Co. and American Cyanamid Corp., operates large alkali producing plants in the Southwest.

Mr. Stevens, with the alkali industry since 1907 and with the Columbia Chemical Division of Pittsburgh Plate for the past 26 years, in 1932 was selected by Southern Alkali to supervise construction of its Corpus Christi, Tex., plant. Since the plant went into production in 1934, Mr. Stevens has served as operating vice president.

Stanley J. Hultman, since 1946 superintendent of the two-year-old Lake Charles, La., plant has been named works manager at Corpus Christi. He joined Pittsburgh Plate in 1930 as an experimental and test engineer at its Barberton, O., chemical plant and served successively as caustic plant superintendent at Barberton and at Corpus Christi (1934 to 1941) and was superintendent of the Texas plant prior to his assignment to Lake Charles.

Charles E. Weeks, with the Texas operation since 1934 as auditor and for the past two years as assistant to Mr. Stevens, is now assistant works manager at Corpus Christi.

C. K. Ballard, superintendent of the caustic and chlorine department at Lake Charles since 1946, has been named plant superintendent. Mr. Ballard joined Southern Alkali in 1934 at Corpus Christi and held successive positions as laboratory and development engineer, production department engineer, and superintendent of the caustic and chlorine department. After 3½ war-years with the Chemical Warfare Service, Mr. Ballard was placed in charge of all process engineering during construction of the Lake Charles plant.

Other appointments at Lake Charles include Alvin T. Raetzsch as superintendent of operations, Frank W. Woodman as superintendent of engineering, and Russell S. Clark as divisional power engineer. In addition Mr. Clark will serve as power engineer consultant to Southern Alkali and to Columbia Chemical.

J. M. Huber Corp., 342 Madison Ave., New York 17, N. Y., through President H. W. Huber, has announced the distribution of a $600,000 bonus among its employes. As part of the Huber bonus and profit sharing plan, the company deposited approximately $170,000 into its salaried employes' profit-sharing trust fund. This sum augments the cash bonuses being paid to all salaried employes with the company for six months or longer. These payments complete the distribution of the 1948 bonus; the hourly wage employes received their extra compensation in the form of a Christmas bonus. In announcing the bonus as part of an expanded employe benefits program, Mr. Huber said that the company feels that when a business has earnings over and beyond the claim of employes to receive fair wages and the claim of owners to receive a fair return on invested capital, the extra profits should be divided between the owners and the workers.

Goodall Rubber Co., Trenton, N. J., has named, as exclusive sales representative for its products in Argentina, Bolivia, Brazil, Chile, Ecuador, Paraguay, Peru, and Uruguay the Pacific International Corp.

Goodyear Appointments

A complete reorganization of field supervision of the mechanical goods sales division of Goodyear Tire & Rubber Co., Akron, O., was announced last month by H. D. Foster, manager of the division. The mechanical goods field organization has been divided into four sales divisions to streamline operations and provide means for more frequent Akron communication with districts. The new organizational change also reduces the size of territories controlled by division managers.

The new eastern sales division, consisting of Boston, New York, Pittsburgh, and Cleveland districts, is in charge of O. A. Schilling; while the central sales division, comprising Chicago, Detroit, Minneapolis, and Cincinnati (this district is now being formed) districts, is under H. E. Langdon. R. B. Warren takes over the southern sales division, including Charlotte, Atlanta, St. Louis, and Dallas districts. R. G. Abbott, who will continue to operate as district manager in Los Angeles, heads the western sales division.

M. W. Sledge has been appointed assistant manager of belting sales department, replacing the late W. F. Hallstein. Mr. Sledge joined Goodyear in 1935 as a member of the production squadron in Akron. He entered sales training in 1936, was transferred to Richmond, Va., entering the mechanical goods division there as sales clerk, was transferred to the Atlanta district as sales clerk, and became a salesman there in mechanical goods in 1938. After his war service (1942-1946) he returned to Goodyear and was made a mechanical goods field representative in Knoxville, Tenn., with headquarters in Atlanta.

Goodyear also reported the following appointments in its chemicals division.

J. A. Weatherford has been made a special sales representative, with headquarters at Chicago, Ill. Transferred from Akron, Mr. Weatherford, who has been with the organization since 1942, has had wide experience with vinyl resins, rubber and resinous latices, paint and rubber compounding.

A. E. Polson has been named a technical representative of the division. Mr. Polson, stationed at Akron for the time being, came to Goodyear with seven years' experience in vinyl resins, cellulose derivatives, fluorinated resins, alkyds, nylon, and impregnated fabrics. During the late war he served in the technical branch of the Army's Office of Strategic Services.

Ralph S. Damon, president of Transcontinental & Western Air, Inc., has been elected a director of the Goodyear company to succeed Thomas E. Wilson, resigned.

Campbell Industries, Inc., Mahomet, Ill., has been appointed Midwest distributer of Pliobond, Goodyear's all-purpose adhesive. The company is headed by James E. Campbell; and Louis E. Odell, with headquarters in Chicago, is in charge of technical service. The company's appointment to Goodyear's growing list of Pliobond distributerships makes possible better on-the-spot service to Midwest industries with adhesive problems.

Development of new gray and red stamping gums, for use in making signature stamps of all kinds, was announced by E. R. Coate, manager of printers' supplies for Goodyear. Modifications in the new stamping gums include improved aging qualities and a very low gravity which permits the production of more stamps from each pound of material than formerly. The new gums are to be used with clay or plastic molds and will cure in five to eight minutes, depending on the amount of steam pressure.

News from Firestone

Firestone Tire & Rubber Co., Akron, O., has assigned E. A. Roberts, tire engineer in charge of passenger-car tire design, to the Detroit area as Firestone resident engineer. Mr. Roberts is widely known in that area for his developments in the field of passenger-car tire engineering, including wide-base rims, and high-speed tire constructions later incorporated in all airplane tires used by the Army and the Navy during the late war. Mr. Roberts joined Firestone in 1925 as a development engineer. During the war he was loaned to the Army Air Forces to establish airplane tire production in England, India, and South Africa.

For the fourth consecutive year Firestone has received the National Safety Council's Award of Honor for distinguished service to safety. Presentation of the award was made on the March 14 broadcast of the "Voice of Firestone" radio program and on the telecast of the company's "Americana" television program. J. E. Trainer, Firestone vice president in charge of production, received the award from James Tanham, chairman of the NSC board of directors. Firestone was given the award for 1948 because the company has "demonstrated its eligibility to receive this fourth award by maintaining rates for frequency and severity of accidents substantially below the most recent averages for similar organizations and by showing marked improvement in comparison with the previous year." The frequency rate for accidents for 1948 of the 21 Firestone plants was reduced by 28%, 77% below the rubber industry average, and the accident severity rate was reduced by 60%, 67% below the industry average. Each of nine Firestone plants accumulated more than one million consecutive hours of work without accidents; while two plants broke the world's safety record for the tire manufacturing industry.

Firestone has received for the second consecutive year the National Garden Institute's Silver Medal for sponsoring the largest and most comprehensive industrial garden program in the country.

J. W. Liska, assistant director of the Firestone research laboratory, has been elected chairman for 1949 of the Division of High Polymer Physics of the American Physical Society.

Expansion of production facilities of Firestone Tire & Rubber Co. of Canada, Ltd., Hamilton, Ont., approximates a $1¼ million investment, according to J. E. Trainer, vice president in charge of production of the parent company in Akron. New facilities at the Canadian plant will provide 92,000 square feet of additional warehouse space for tires.

Hood Rubber Co., division of The B. F. Goodrich Co., in Watertown, Mass., has developed a new resilient rubber-backed floor covering with a simulated broadloom design surface for use where carpeting is difficult to maintain. According to President C. L. Muench, the new product, called Hood Arrazin Carpet, is being produced in five colors and three thicknesses. The tough long wearing, embossed surface is made from Geon resins, with cushioning provided by a cellular rubber base. The material, made in 36-inch rolls, is cemented to the floor during installation. The covering has been tested for a year in trains, airplanes, elevators, and other places where heavy pedestrian traffic, noiselessness, foot comfort, and ease of maintenance are important considerations.

Make Your Rubber Products

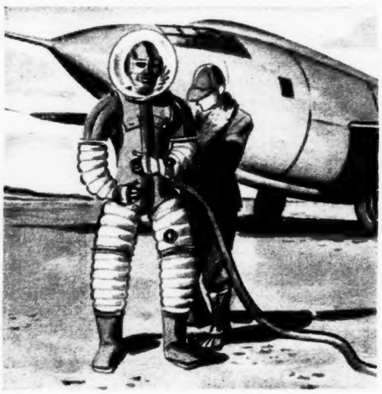
Better...Faster...For Less!

● **S/V SOVALOID C** . . . This versatile, low-cost plasticizer is suitable for use with both rubber (Buna N) and vinyl resins. S/V Sovaloid C has high resistance to oil and aromatic solvents.

These proved
Socony-Vacuum plasticizers
and wax emulsions will improve
your processing operations
and lower your costs.

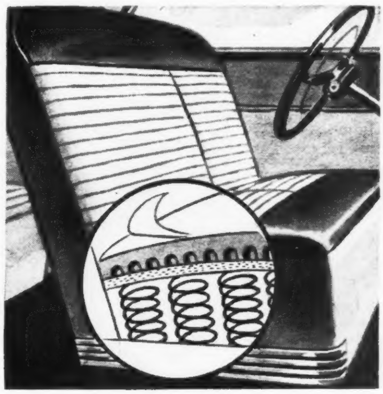
Back of them is
skilled technical service
to study your problems, assist
in correct applications,
and develop new products,
where they are needed.

● **S/V SOVALOID A SPECIAL** . . . Here's a general-purpose, light processing oil for GR-S, Neoprene, natural rubber, and blends of GR-S and natural rubber. It has unusual light stability characteristics.



● **S/V SOVALOID L** . . . If you are looking for a plasticizer to make Neoprene stay flexible at low temperatures, here is the answer to your problems. S/V Sovaloid L is ideal for this purpose.

● **S/V SOVALOIDS H, W and N** . . . These are heavy processing oils for plasticizing natural rubber, GR-S and Neoprene. They have good milling characteristics and high dispersive properties.



● **S/V CEREMULS** . . . These wax emulsions have proved their superiority in Neoprene sponge rubber as anti-tack agents. They also have proved their value in vinyl latices as anti-blocking agents.

SOCONY-VACUUM
PROCESS PRODUCTS

Process Products
SOCONY VACUUM

SOCONY-VACUUM OIL COMPANY, INC., 26 Broadway, New York 4, N.Y., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

Erecting New Branch Building

A new office building and warehouse for the Jacksonville district of The B. F. Goodrich Co., Akron, O., now being built on Dennis and Watts Sts., will be ready for occupancy about June 1. At that time the staff will move from its present location at Adams and Lee Sts., the Goodrich store. Plans already are being drawn to remodel the store.

Leased for 10 years, the new building has a frontage of 105 feet on Dennis and extends 210 feet along Watts with a railroad siding in the rear. One story, the building is being constructed of brick, with steel trusses and metal roof deck and has a total of 18,800 square feet, of which 3,300 are to be used as district offices and 15,500 for warehousing. Offices are to be air-conditioned and equipped with the recessed-type fluorescent lights.

Three truck loading docks are on the Watts St. side of the building, allowing quick shipments of tires, tubes, and diversified auto and home merchandise which will be stocked in the warehouse.

Goodrich tubeless tires are now on sale in the Jacksonville, Fla., district following a recent public demonstration of the tire's performance characteristics at Miami. This district is the third in the nation to place the tire on sale; it was introduced at Cincinnati, O., and Indianapolis, Ind., last year. Nation-wide distribution of the tubeless tire is hoped for during 1949.

A new use for rubber hydraulic control hose on large Diesel powered trucks is reported by Goodrich. The company's hose is being used successfully on the Diesel fuel injection systems, replacing copper or flexible metallic tubing ordinarily used for this purpose which often breaks off behind the couplings owing to vibration.

Goodrich also announced the following changes in its associated lines sales division.

H. T. Goodenberger, with the company two decades, has been made merchandise manager, responsible for the creation of the merchandising programs of the division, which handles sales of Brunswick, Diamond, Hood, and Miller brands of tires and accessories.

George B. Markle, who started with the company 23 years ago, has been named manager of tire sales in the division.

W. A. Green, also in Goodrich service 23 years, has been appointed manager of special accounts sales, consisting mainly of sales to oil company marketers.

J. J. Allman has been made manager of accessories sales. Mr. Allman, a 12-year man, succeeds M. J. Way, resigned.

F. C. Schulz has been made office and operating manager of the division, with which he had started in 1935 as a budget manager in Cleveland.

General Aniline & Film Corp., New York, N. Y., recently commenced operations at its new pilot-plant at Grasselli, N. J., where acetylene derivatives will be produced under high pressures and elevated temperatures. Developed in Germany during the war and further improved by General Aniline chemists, the process consists of two methods, one involving dilution of acetylene with an inert gas, and the other involving reaction of acetylene in small-bore equipment which provides a minimum of free space for gases to collect. The work being done in the plant involves the processes of vinylation and ethynylation, and further development work is under way.

U. S. Rubber Executive Changes

William M. Dougherty last month was elected secretary of United States Rubber Co., Rockefeller Center, New York 20, N. Y., to succeed the late Eric Burkman. Mr. Dougherty has been with the company 26 years, since 1947 as assistant to the president. The new secretary was graduated from Princeton University in 1919 and then worked for a Wall Street investment firm. In 1923 he became a member of the commercial research department of U. S. Rubber and later was appointed coordinator of production and sales in the Detroit tire plant. In 1934, Mr. Dougherty was placed in charge of the central sales and production coordination department and in 1941 was elected assistant secretary of the company.

G. Roger McNear has been appointed assistant to President Harry E. Humphreys, Jr., to succeed Mr. Dougherty. Mr. McNear was educated in the public schools of Newton, Mass., and at Massachusetts Institute of Technology. He began his career with U. S. Rubber in 1933 as a tire salesman in Boston. In 1937 he became district manager of tire sales in Buffalo and later general sales manager of Gillette tires. In 1942, Mr. McNear was made factory manager of the company's Detroit tire plant and subsequently sales manager for the Pacific Coast. Most recently he was manager of special brands and general service for the tire division.

Three major staff promotions in the mechanical goods, general products, Lastex yarn and rubber thread divisions were announced last month by Ernest G. Brown, vice president and general manager of the divisions.

Walter F. Spoerl, general sales manager of the mechanical goods division, has been appointed general sales manager for all divisions under Mr. Brown's supervision. Robert D. Gartrell, development manager for the company's Passaic, N. J., plant, has been named development manager for all divisions; and Wesley A. Armstrong, factory manager of the company's Bristol, R. I., plant, has been named production manager.

Mr. Spoerl began 40 years ago as a clerk in the company's sales offices in Chicago; transferred to New York in 1934 as assistant manager, branch sales, mechanical goods; became merchandise manager of the mechanical goods division in 1944; and in 1946 was named general sales manager for the division.

Mr. Gartrell joined Dominion Rubber Co., Ltd., Canadian subsidiary of U. S. Rubber, in 1917 and served in various technical positions until he was appointed director of development for Dominion Rubber, with headquarters in Montreal. He returned to the United States in 1931 to become development manager of the Passaic, N. J., plant of U. S. Rubber in charge of mechanical goods.

After 13 years of consulting work in industrial engineering, sales, and production, Mr. Armstrong joined the rubber company as production superintendent at its Bristol plant; in 1939 was made assistant factory manager of the plant, and in 1941 factory manager.

Frederick S. Bartlett has been appointed factory manager of the Bristol plant where he began his rubber career 23 years ago as a chemist in the laboratory. He developed a process for insulating wire with rubber by dipping the wire into natural rubber latex and holds a patent on a mechanical applicator for applying latex to wire. Mr. Bartlett became chief chemist of the Bristol plant in 1937, development manager in 1940, and assistant factory manager in 1944.

Appointment of Frederick P. Combier as sales manager and Robert C. Cassidy as chief engineer for Uskon electrical heating panels was announced recently. Both men will make their headquarters in the company's New York offices.

Ten district sales managers have been appointed by the electrical wire and cable department to supervise sales of electrical wire and cable in major cities throughout the country. The appointments give the company's electrical wire and cable department an independent nation-wide sales organization equipped for the fastest possible service to electrical wire consumers. The new managers and their respective territories follow: C. W. Short, Boston; J. D. Drohan, New York; H. J. Cluver, Philadelphia and Baltimore; C. C. Hronek, Atlanta, Birmingham, and New Orleans; E. W. Renfree, Detroit, Cleveland, and Pittsburgh; G. E. Hubrig, Chicago, Milwaukee, and Minneapolis; L. E. Dickinson, St. Louis, Cincinnati, and Indianapolis; A. B. Gangwer, Kansas City, Tulsa, Omaha, and Denver; R. S. Keith, Dallas and Houston; and L. M. Guibara, Los Angeles, San Francisco, Portland, Seattle, and Salt Lake City.

U. S. Tires division has made the following appointments: W. J. Palmer, New York district manager, succeeding J. A. Boll, now manager of dealer development; C. W. Ort, district manager for Portland, Oreg.; H. D. Smith, district manager at Newark, N. J.

Fisk tires division has established a Pacific Coast division comprising the area of the Los Angeles and Portland sales district. Manager of the division, with headquarters at Los Angeles, is C. J. Morgan, formerly Fisk district manager for New York, which post now goes to T. F. Newlin.

The company has also opened a Philadelphia sales office, with J. W. Green as district manager.

J. Duncan Webb has been elected treasurer of United States Rubber Export Co., Ltd., to succeed J. F. Schnugg, who has retired after 36 years of service. Mr. Webb started with U. S. Rubber Co. in 1934 as an auditor in its New York offices, later was promoted to a supervisory position, and in 1940 was transferred to Atlanta as office manager of the company's southeastern district. During the war he held important positions in the company's defense plants at Williamsport, Pa., Joliet, Ill., and Des Moines, Iowa. Then in September, 1946, he was named comptroller of the export subsidiary, a position made part of the treasurer's responsibility with Mr. Webb's election.

Other Company Activities

Production of "cold rubber" latex began on March 22 at U. S. Rubber's Naugatuck, Conn., plant, according to Howard R. Gaetz, plant superintendent. The plant will produce 2,500 tons of "cold rubber" latex annually for use in large-scale service trials in such products as saturated paper and fiber materials, adhesives, foam rubber, gaskets, brake lining, tire cord dipping solutions, and wire insulation. These 2,500 tons amount to about 8% of the plant's total rated capacity, and Mr. Gaetz predicted a need of installing additional equipment to produce this latex if the material proves as successful in new uses as it has in tires.

U. S. Rubber has moved its Chicago branch offices from 440 W. Washington St., to larger quarters at the Merchandise Mart Bldg.

A series of television "spot" programs is being employed by U. S. Rubber over 26 key stations from coast to coast to promote its U. S. Royal Air Ride tire. Inaugurated March 14 as a three-time weekly show for 26 weeks, the program consists of a series of one-minute animated cartoons on film which graphically describe the riding qualities and safety features of the tire.

U. S. Rubber's footwear division is sponsoring the juvenile television program, "Lucky Pup," over the entire CBS network, which started March 25. The program is a lively puppet show popular with children five to 13 years old. Commercials on the program will be designed to build sales for the company's Keds dealers, and the "Keds Handbook of Sports," the shoes, and their features will be stressed. The program will appear for 15 minutes every Friday, and attractive posters on "Lucky Pup" are being furnished to stores handling the shoes.

The Buckeye Reliner Producing Co., 635-71 N. Jackson St., Lima, O., according to President Ben Rakowsky, has changed its corporate name to Buckeye Rubber Products, Inc., but has made no change in management, personnel, or organization. The firm originally was formed in 1914 to manufacture patches and reliners, which products since have been discontinued. During the years the company extended its sphere in the rubber industry to include any rubber items in the automotive and industrial fields, except tires and tubes. The old name, therefore, has been outgrown and was misleading.

The General Tire & Rubber Co., Akron, O., had advanced Charles L. Howes, from central division manager to the newly created post of southwest division sales manager, with headquarters in Dallas, Tex., where he will supervise sales operations in the territories now serviced by General's branch offices in Dallas, Memphis, Houston, St. Louis, and Kansas City—the principal marketing areas in a 15-state division. Mr. Howes has served his entire 26 years in the sales organization at General working with the distributer organization. He spent from 1927 to 1936 covering the same territory over which he now has been appointed chief sales executive. He headed the central division for 10 years. He joined General's selling organization after a brief tenure as a mathematics professor in Kentucky.

Warwick Chemical Co., division of Sun Chemical Corp., 10-10 44th Ave., Long Island City 1, N. Y., has created a new organic chemicals department to concentrate on the production of industrial organic chemicals for all industries and on the development of household, industrial, and other non-textile uses for synthetic detergents and other surface-active agents. New production facilities for the department are being installed at the Warwick plant at Wood River Junction, R. I., and large-scale commercial production of several new products is expected to begin in the near future.

General manager of the new department is Walter E. Scheer, a chemical consultant for the past several years and president of Scheer Chemical Co., Inc. His previous connections also include Hardesty Chemical Co., Inc., and its affiliate, Amecco Chemicals, Inc., where he had been vice president in charge of sales.

Raymond J. Hull

Hull with Philblack

C. C. Crawford, vice president and sales manager of Phillips Chemical Co., Akron 8, O., has announced the appointment of Raymond J. Hull as manager of export technical service in the Philblack sales division. Mr. Hull will headquarter at the New York, N. Y., Philblack office, but will devote a major part of his time in supplying direct technical service to Philblack customers throughout the world. He will be associated with H. W. Grote, director of Philblack export sales.

Immediately upon graduation from Purdue in 1927, Mr. Hull was employed by The B. F. Goodrich Co. He was on loan to the office of Rubber Director, WPB, as head of the Tire and Tube Specification Section during that period in which the country's tire and tube industry was rapidly converting from natural to synthetic rubber. Subsequently he returned to Goodrich as manager of airplane tire construction and design and served as company representative on various industry committees cooperating with the Armed Services in the development of tires for new aircraft.

Postwar, Mr. Hull has been production manager in charge of six Goodrich service departments, covering many tire and tube manufacturing operations. From August, 1947, to November, 1948, he was factory manager in the startup operations of the new tire and tube factory in Loosduinen, Holland.

Stephen P. Turke has been appointed general manager and a director of Davidson Rubber Co., Charlestown, Mass. From 1939, Mr. Turke held various executive and administrative positions with the Cambridge Rubber Co., and his duties covered operations in both this country and Canada. Mr. Turke is also a member of the American Chemical Society and the American Management Association.

Controllers Institute of America, 1 E. 42nd St., New York 17, N. Y., has elected the following new members: James E. Caldwell, assistant comptroller, The Goodyear Tire & Rubber Co., Akron, O.; T. M. Mayberry, vice president and treasurer, Firestone Tire & Rubber Co. of Canada, Ltd., Hamilton, Ont.; George F. Plummer, secretary-treasurer, Dunlop Tire & Rubber Goods Co., Ltd., Toronto.

Stationers' Exhibition

The trade show of the thirty-third annual convention of the Wholesale Stationers' Association, at the Commodore Hotel, New York, N. Y., March 1-3, was housed in the east and west ballrooms of the hotel. Among the 83 exhibits were displayed such products as erasers, rubber bands, pen sacs, finger cots, tapes, rubber cements and adhesives, and plastic telephone covers, calendar holders, and rulers. Some of the companies exhibiting were: American Lead Pencil Co., Binney & Smith Co., and Eagle Pencil Co., all of New York; Joseph Dixon Crucible Co., Jersey City, N. J.; Eberhard Faber Pencil Co., Newark, N. J.; Industrial Tape Corp., New Brunswick, N. J.; Le Page's Inc., Gloucester, Mass.; and Plymouth Rubber Co., Canton, Mass.

Farrel-Birmingham Co., Inc., Ansonia, Conn., has appointed M. H. Blank representative in the Detroit area to handle the sale of gears and gear units manufactured at the company's Buffalo, N. Y., plant. Mr. Blank, with offices at 901 Lafayette Bldg., Detroit 26, Mich., has been engaged in sales engineering activities as manufacturers' agent in and around Detroit for the past few years. His previous business experience has centered around sales engineering and production development work with well-known manufacturers of industrial and automotive equipment.

Navy Purchasing Office, 111 E. 16th St., New York, N. Y., recently made awards on the following: 2,000 yards of rubber mats to Ace Rubber Products, Inc., Akron, O.; 30,200 yards, rubber matting, Boston Woven Hose & Rubber Co., Cambridge, Mass.; 2,850 yards, rubber matting, Quaker Rubber Corp., Philadelphia, Pa.; 13,000 feet, synthetic matting, and 1,000 feet, rubber mattings, Manufactured Rubber Products Co., Philadelphia; 1,000 feet, rubber matting, Minor Rubber Co., Inc., Newark, N. J.

The Timken Roller Bearing Co., Canton 6, O., has made M. S. Downes general sales manager of the railway division, succeeding the late W. S. Sanders, under whom he had been assistant general sales manager for the past two decades. The latter position is now held by J. E. McCort, formerly district manager of the railway sales division in Cleveland.

Ralph G. Harmon, a sales engineer in the Chicago office for Timken, has become district manager of the firm's industrial and steel and tube divisions in Birmingham, Ala.

George D. Seguin, purchasing agent of the Norton Co., Worcester, Mass., has been named general purchasing agent to succeed the late Paul Fielden.

The Eagle-Picher Co., American Bldg., Cincinnati, O., at its annual shareholders' meeting on March 22 reelected the board of directors for the coming year, including Vincent H. Beckman, Arthur E. Bendelari, Joel M. Bowlby, Carl A. Geist, Carl F. Hertenstein, Joseph Hummel, Jr., Elmer Isern, Robert E. Mullane, John J. Rowe, T. Spencer Shore, and Miles M. Zoller. All officers of the company also were reelected: Mr. M. Bowlby, chairman of the board; Mr. Shore, president; Mr. Geist, vice president and secretary-treasurer; Wm. R. Dice, vice president and comptroller.

leaves from a Rubber Chemist's notebook

· PEPTON 22 PLASTICIZER

Re: PEPTON* 22 PLASTICIZER
(peptizer or catalytic plasticizer)

Recommended for natural rubber or various types of GR-S.

Free flowing powder

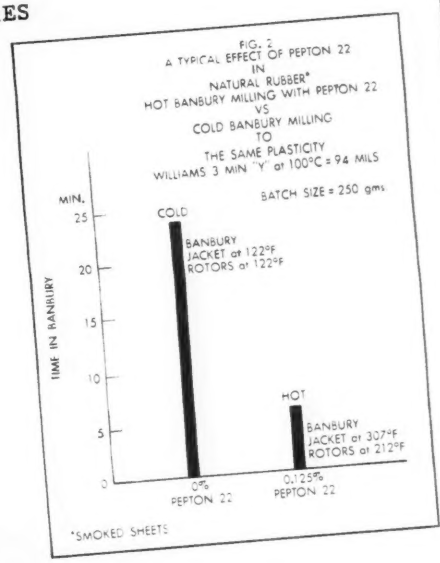
Non staining

Non-toxic

IMPROVES PROCESSING QUALITIES
REDUCES POWER CONSUMPTION

REMARKS:

shows drastic reduction of breakdown time on hot mastication — see chart



RECOMMENDED PERCENTAGES

—for natural rubber, try from about 0.1 to 0.5 parts per 100 parts of rubber, depending on the time, temperature of milling and plasticity desired.

—for GR-S, try about 1.0 to 3.0 parts per 100 parts of GR-S, depending on the time, temperature of milling, plasticity desired and polymer used.

*Reg. U.S. Pat. Off.

Calco

SALES REPRESENTATIVES and WAREHOUSE STOCKS: Akron Chemical Company, Akron, Ohio • Ernest Jacoby & Company, Boston, Mass. • Herron & Meyer of Chicago, Chicago, Ill. • H. M. Royal, Inc., Los Angeles, Calif. • H. M. Royal, Inc., Trenton, N. J. • In Canada: St. Lawrence Chemical Company, Ltd., Montreal and Toronto.

AMERICAN *Cyanamid* COMPANY
CALCO CHEMICAL DIVISION
RUBBER CHEMICALS DEPARTMENT
BOUND BROOK, NEW JERSEY

NEWS ABOUT PEOPLE

Foster Dee Snell, president of Foster D. Snell, Inc., firm of consulting chemists and engineers, 29 W. 15th St., New York 11, N. Y., has been named by unanimous vote of the council of the Society of Chemical Industry, London, to receive the Society's Gold Medal for 1949. This medal, awarded bi-annually to a person "who has attained eminence in applied chemistry," will be presented at the Society's meeting at Manchester, England, July 13, when Dr. Snell will deliver an address on a phase of surface activity.

G. W. Naylor, formerly general manager of manufacturing for Sun Chemical Corp., has been named manager of the development section, chemical division, Koppers Co., Inc., Pittsburgh, Pa.

J. Robert S. Conybeare has been named general sales manager of The Wooster Rubber Co., Wooster, O., manufacturer of "Rubbermaid" housewares. Mr. Conybeare joined the company in 1947, following service as advertising manager and assistant sales manager of Dailey Mills, Inc., and sales work with Liberty Can & Sign Co.

C. F. Gimber has been appointed New England representative, with headquarters at 88 Broad St., Boston 10, Mass., for the crude rubber brokerage of H. A. Astlett & Co., 27 William St., New York 5, N. Y.

Willard D. Peterson has joined Arthur D. Little, Inc., Cambridge, Mass., and will consult for the firm in the fields of process development and the general field of photographic materials and facsimile duplication. Dr. Peterson was previously associate director of research and development at J. T. Baker Chemical Co.

C. S. McIntyre III, son of B. D. McIntyre, president of Monroe Auto Equipment Co., Monroe, Mich., has been appointed service manager of the company. The younger Mr. McIntyre had served for the past year with Newgren Co., Butler Pa., as sales manager in the Michigan, Indiana, and Kentucky area. Mr. McIntyre represents the third generation of McIntyres, who founded Monroe Auto Equipment Co. some 30 years ago.

George R. Steinbach is now operating as Merit Western Co., serving the industry as manufacturers' agent, with office and warehouse stocks at 1248 Wholesale St., Los Angeles 21, Calif. Mr. Steinbach was formerly owner of Atlas Sponge Rubber Co. and prior to that had been active for many years in sales and service of raw materials and supplies to the rubber manufacturing and allied industries.

Charles W. Walker recently retired as chief rubber research chemist of the American Steel & Wire Co., electrical cable works, Worcester 7, Mass., after 38 years with the company.

Willis T. Windle has been elected controller and treasurer of Carborundum Co., Niagara Falls, N. Y.

Eric Bonwitt, dealer in rubber machinery at 431 S. Dearborn St., Chicago, Ill., on April 1 completed a decade of business in the United States with the rubber and allied industries. Mr. Bonwitt, who was born in Hanover, Germany, started with the rubber industry there at the turn of the century and went into business for himself after World War I. He dissolved this business, however, and came to the United States in 1938. One year after his arrival in Akron, O., Mr. Bonwitt again established his own firm and delayed his planned move to Chicago until the end of the late war to await the safe return of his son, Bernhard, who had served in the Armed Forces for 56 months as a combat-photographer in the European Theater.

J. T. Cox, Jr., deputy director, Office of Rubber Reserve, recently received an honorary degree of Doctor of Engineering from the Case Institute of Technology, Cleveland, Ohio.

Walter C. Burns has been made San Francisco district sales manager for Pioneer Rubber Mills, San Francisco 11, Calif.

Clifton Slusser, vice president, The Goodyear Tire & Rubber Co., Akron, O., died March 25 after a long illness. His obituary will appear in our next issue.

C. Rogers McCullough, of Monsanto's general development department, last month was awarded the U. S. President's Certificate of Merit "in recognition of invaluable wartime scientific services." A member of the central research department during the war, Dr. McCullough directed various phases of rocket propellant and motors work for the National Research Defense Committee, was consultant member of Division Eight of the Committee, and also did considerable work for the Office of Rubber Reserve in the development of styrene.

J. J. Clifford, Jr., has been appointed general manager of Stedfast Rubber Co. (Canada), Ltd., Granby, P.Q., to succeed the late Louis G. Chauvin.

Willard H. Dow, president, Dow Chemical Co., Midland, Mich., was killed in a plane crash March 31. His obituary will be written up next month.

WEST

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill., to take care of increased business, has moved its Spokane warehouse and district sales office to new and larger quarters at N. 1303 Washington St., Spokane 13, Wash. Homer A. Garland is district sales manager at Spokane; while J. F. Strott, Link-Belt Pacific Division vice president and plant manager at Seattle, is in general charge of Pacific Northwest operations.

Union Asbestos & Rubber Co., Cicero 50, Ill., recently purchased from the WAA a plant at McGregor, Tex., comprising 75,000 square feet of manufacturing space and 125 acres of land. Manufacturing operations, to be devoted principally to high-temperature insulating materials, are expected to begin about July 1. When in full production, the new plant is expected to add substantially to the volume of products already being manufactured in the company's plants in Cicero, Earlville, Ill., Paterson, N. J., and Davidson and Marshville, N. C.

J. B. Crawford, plant manager of the Cicero plant for the past several years, is being transferred to McGregor, also as plant manager.

Minnesota Mining & Mfg. Co., St. Paul 6, Minn., on March 7 began production at the former Plancor plant No. 80 at Bristol, Pa., purchased last summer from the WAA. Manager of the unit is Robert N. Wolfe. C. B. Sampair, company vice president in charge of production, indicated that there will be "35 or 40 persons" employed at first in the production of adhesives and coatings, and the office will be staffed by about 10 persons. His announcement also stated that other lines, including some adhesive tapes, will go into production about May 1 and that ultimately the plant will employ about 350 workers.

National Sporting Goods Association recently moved to 1 N. La Salle St., Chicago 2, Ill. These headquarters will serve as offices for Secretary G. Marvin Shutt and his staff.

CANADA

New Cabot Representative

Godfrey L. Cabot, Inc., raw materials manufacturer, Boston, Mass., has appointed Delacour-Gorrie, Ltd., 880 Bay St., Toronto, Ont., its exclusive representative for the sale of carbon black and pine distillates throughout Canada. The company will also act as sales agents for General Atlas Carbon Co., Cabot subsidiary in Pampa, Tex., and producer of Pelletex and Gastex carbon blacks.

P. H. Delacour and F. R. Gorrie recently retired from Harrisons & Crosfield (Canada), Ltd., to form Delacour Gorrie, Ltd. Mr. Delacour was with Harrisons & Crosfield for the past 15 years as manager of the Ontario division and in 1944 was appointed a director. Mr. Gorrie was with Canada Printing Ink Co., Ltd., from 1935 to 1942, when he joined the sales staff of Harrisons & Crosfield. He is also a past president of The Toronto Paint & Varnish Production Club and a former member of the National Federation of Paint & Varnish Production Clubs.

Itarco, Ltd., is a wholly owned subsidiary of Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., which was incorporated last year by Dunlop for the purpose of producing and selling in Canada certain products of India Tyre & Rubber Co., Ltd., Inchinnan, Scotland, under agreement with that company.

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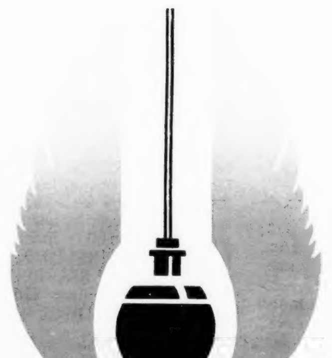
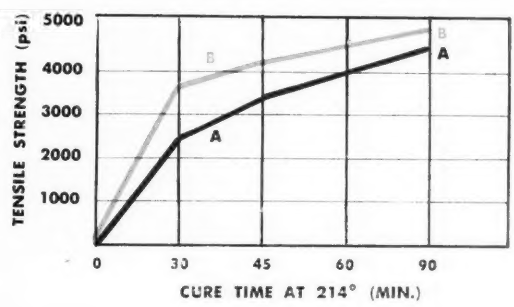
TEST RECIPE

COMPOUND	A	B
SMOKED SHEETS	100.0	100.0
ZINC OXIDE	10.0	10.0
SULPHUR	2.0	2.0
STEARIC ACID	1.0	1.0
ULTEX	**0.5**	**0.75**





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FINANCIAL

Allied Chemical & Dye Corp., New York, N. Y. For 1948: consolidated net income, $31,771,204, a new high and equal to $14.35 each on 2,401,288 common shares, compared with $30,311,484, or $13.69 a share, in the preceding year.

American Cyanamid Co., New York, N. Y., and subsidiaries. For 1948: net income, $11,875,090, equal to $5.20 a common share, contrasted with $9,156,249, or $3.72 a share, the year before; net sales, $231,992,219, a new high, against $214,581,-400; income taxes, $5,900,000, against $5,-600,000.

American Hard Rubber Co., New York, N. Y., and subsidiary. For 1948: net income, $499,801, equal to $4.35 each on 88,-477 common shares, compared with $623,-232, or $5.75 a share, in 1947; net sales, $16,378,006, against $17,695,471.

American Zinc, Lead & Smelting Co., Columbus, O., and wholly owned subsidiaries. Fourth quarter, 1948: net profit, $536,537, equal to 67¢ a common share, compared with $241,707, or 23¢ a share, in the 1947 period; net sales, $9,581,171, against $9,222,838.

Baldwin Locomotive Works, Philadelphia, Pa. For 1948: net income, $3,167,-741, equal to $1.26 each on 2,375,553 common shares, against $2,651,331, or $1.33 each on 1,875,553 shares, in 1947; sales, $126,434,845, against $94,884,746.

Belden Mfg. Co., Chicago, Ill. Twelve months to December 31, 1948: net income, $961,496, equal to $3 a common share, against $1,230,159, or $3.83 a share, in the previous year.

Borg-Warner Corp., Chicago, Ill. For 1948: net profit, $26,214,993, equal to $10.93 a common share, contrasted with $20,023,-184, or $8.28 a share, in the preceding year; reserve against inventory price declines, $3,500,000, against $4,500,000; sales, $309,253,830, against $258,388,981.

Brown Rubber Co., Inc., Lafayette, Ind. For 1948: net income, $891,492, equal to $3.55 a common share, against $810,890 in 1947; provision for federal income taxes, $549,000, against $501,533; current assets, including $638,569 cash, $1,381,417, against $1,333,164, including $622,560 cash; current liabilities, $339,884, against $369,560.

Brunswick-Balke-Collender Co., Chicago, Ill., and subsidiaries. For 1948: net profit, $2,401,347, equal to $5.04 each on 450,000 common shares, compared with $1,579,556, or $3.21 a share, in 1947; net sales, $30,487,740, against $28,838,424; federal income tax, $1,355,000, against $1,025,-000.

DeVilbiss Co., Toledo, O., and wholly owned subsidiary. For 1948: net profit, $947,967, equal to $3.16 each on 300,000 capital shares, compared with $938,891, or $3.13 a share, a year earlier; net sales, $15,745,922, against $16,294,049; income taxes, $606,551 against $514,688.

Canada Wire & Cable Co., Ltd., Leaside, Ont. For 1948: net income, $1,364,771, equal to $8.27 a class "B" share, against $1,474,517, or $9 a share, in 1947.

Canadian General Electric Co., Peterborough, Ont., Canada. For 1948: net profit $5,300,000, equal to $27.49 a share, against $3,144,000, or $16.04 a share, the year before.

Canadian Raybestos Co., Ltd., Peterborough, Ont. For 1948: net income, $103,-110, against $151,574 in 1947: net sales, $1,430,118, against $1,541,232.

Carborundum Co., Niagara Falls, N. Y. For 1948: net profit, $1,046,922, equal to $2.06 a share, against $1,878,629, or $3.69 a share, the year before.

Philip Carey Mfg. Co., Cincinnati, O. For 1948: net profit, $3,018,277, equal to $3.67 a common share, against $2,806,692, or $3.41 a share, the year before.

Columbian Carbon Co., New York, N. Y., and subsidiaries. For 1948: net profit, $6,504,865, equal to $4.03 each on 1,612,218 common shares, contrasted with $6,064,196, or $3.76 a share, in the previous year; sales, $42,920,977, against $41,106,-104; income taxes, $2,725,000, against $2,-825,000.

Cooper Tire & Rubber Co., Findlay, O. For 1948: net loss, $133,670, compared with net income of $145,976, or 93¢ each on 156,721 shares, in 1947; net sales, $7,769,-063, against $11,808,712.

Dewey & Almy Chemical Co., Cambridge, Mass. For 1948: consolidated net profit, $700,396, equal to $2.19 each on 319,949 common shares, compared with $671,086, or $2.18 a share, a year earlier; net sales, $15,860,531, a record and 11% above the '47 figure.

Diamond Alkali Co., Painesville, O. For 1948: net income, $5,280,632, equal to $4.86 each on 1,062,434 common shares, against $4,554,130, or $4.19 a share, the year before; consolidated net sales, $51,-230,184 (a record), against $40,220,291.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., and wholly owned subsidiaries. For 1948: net earnings, $157,445,-622, equal to $13.12 a common share, against $120,009,760, or $9.88 a share, in 1947; sales, $968,700,000, against $783,700,000; provision for federal income taxes, $92,-150,000, against $68,720,000.

Garlock Packing Co., Palmyra, N. Y. For 1948: net income, $1,369,581, equal to $3.27 a share, contrasted with $1,276,731, or $3.75 a share, in the preceding year.

General Cable Corp., New York, N. Y. For 1948: net income, $4,131,742, equal to $1.75 each on 1,917,610 common shares, compared with $6,158,266, or $2.79 each on 1,898,614, shares in the preceding 12 months; federal income taxes, $2,375,000, against $3,500,000; inventories $5,332,052, against $8,421,138; current assets, $25,299,-310, against $28,509,051; current liabilities, $7,067,576, against $7,402,517.

Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., Canada. For 1948: net profit, $244,530, equal to $3.58 a common share, against $388,497, or $6.12 a share, in the preceding 12 months.

Eagle-Picher Co., Cincinnati, O., and subsidiaries. Year ended November 30, 1948: net profit, $4,067,742, equal to $4.57 each on 889,076 capital shares, against $3,605,842, or $4.05 a share, in the preceding fiscal year; net sales, $79,478,724, against $77,668,421.

Farrel-Birmingham Co., Inc., Ansonia, Conn. For 1948: net income, $1,659,627, equal to $5.19 a common share, compared with $1,052,193, or $3.29 a share, for the previous year.

General Electric Co., Schenectady, N. Y., and affiliates. For 1948: net income, $123,835,316, a new high and equal to $4.29 each on 28,845,036 common shares, compared with $95,298,940, or $3.30 a share, for 1947; net sales billed, $1,632,700,606 (another record), against $1,330,776,375; federal income taxes, $93,700,000, against $64,798,572.

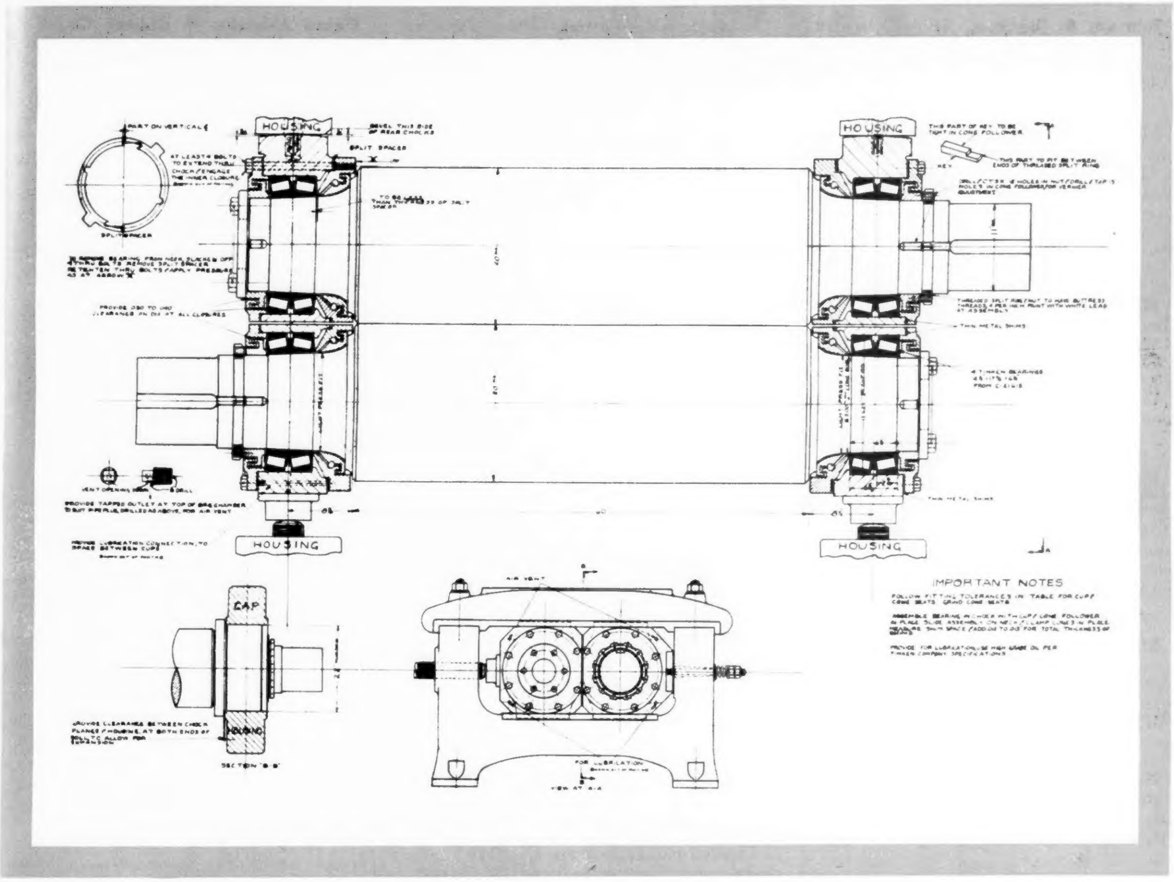
General Motors Corp., Detroit, Mich. For 1948: net earnings, $440,447,724, a new peak and equivalent to $9.72 a common share, contrasted with $287,991,373, or $6.24 a share, the year before; net sales, $4,701,770,340 (another peak), against $3,815,159,163.

General Tire & Rubber Co., Akron, O., and subsidiaries. Year ended November 30, 1948: net profit, $4,783,617, equal to $7.33 a common share, compared with $5,-872,472, or $9.08 a share, in the preceding fiscal year; net sales, $105,908,203, against $126,136,242; federal income taxes, $2,832,-850, against $3,898,000; inventories, $27,-736,308, against $19,584,361; current assets, $50,030,828, against $42,409,458; current liabilities, $14,536,461, against $17,921,055.

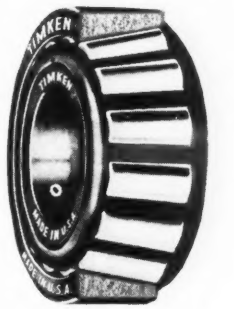
B. F. Goodrich Co., Akron, O., and subsidiaries. For 1948: net income, $23,740,-705, equal to $16.57 each on 1,308,320 common shares, compared with $23,231,063, or $16.18 a share, in 1947; net sales, $419,-798,703, a new high, against $410,180,839; reserve for contingencies, etc., $8,000,000, against $6,500,000; income taxes, $21,905,-000, against $19,813,000; inventories, $99,-908,916, against $88,940,417; current assets, $181,201,917, against $165,772,294; current liabilities, $32,811,965, against $36,821,680.

Hewitt-Robins, Inc., Buffalo, N. Y. For 1948: net income, $737,767, equal to $2.65 each on 278,714 capital shares, contrasted with $1,223,618, or $4.39 a share, in the previous year; net sales, $19,623,002, against $21,609,351; federal income taxes, $397,744, against $817,372; inventories, $5,-039,699, against $4,131,856; current assets, including $1,111,254 cash, $8,882,987, against $2,344,662 and $9,135,520, respectively, on December 31, 1947; current liabilities, $2,-728,333, against $3,038,032.

Midwest Rubber Reclaiming Co., East St. Louis, Ill. Year ended October 31, 1948: net income, $674,105, equal to $2.10 a common share, against $458,646, or $1.32 a share, in the preceding fiscal year.



How To Improve Rubber Mill Performance and Reduce Maintenance



Everything else being equal, rubber mills equipped with Timken Balanced Proportion Roller Bearings perform better, possess greater availability for service, last longer, cost less for operation and maintenance.

Mills have greater rigidity because Balanced Proportion bearings make possible larger roll neck diameters with 50% to 60% increased neck strength. Load ratings are higher, too — up to 40% higher than previous designs of tapered roller bearings, size for size.

A typical example of the application of Timken Balanced Proportion Bearings to rubber mill roll necks is shown in the drawing. There is a standardized application ready for your new or existing mills. Consult the mill builder or our engineers. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address "TIMROSCO".

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Johnson & Johnson, New Brunswick, N. J. For 1948: net income: $11,399,591, equal to $5.83 a common share, against $9,452,909, or $4.98 a share, in 1947.

Link-Belt Co., Chicago, Ill. For 1948: consolidated net earnings, $11,731,863, equal to $14.37 each on 816,488 common shares, against $7,016,042, or $8.68 each on 807,930 shares, in 1947; consolidated net sales, $106,008,988 (a record), against $87,322,-706.

Minnesota Mining & Mfg. Co., St. Paul, Minn. Year ended December 31, 1948: net income, $13,234,756, equal to $6.51 each on 1,972,845 common shares against $10,715,-376, or $5.47 each on 1,951,530 shares, in 1947; sales, $108,246,410, a new high, against $93,437,137.

Mohawk Rubber Co., Akron, O. For 1948: net sales, $8,482,375, against $8,242,-956 in 1947; net income, $388,528, equal to $2.74 a share; provision for federal income taxes, $226,745; inventories $1,439,614; current assets, including $437,764 cash, $3,-156,139, current liabilities, $380,161.

Mt. Vernon-Woodberry Mills, Inc., New York, N. Y. For 1948: net income, $5,699,667, equal to $17.04 a common share, against $4,003,961, or $11.72 a share, in 1947.

National Rubber Machinery Co., Akron, O. For 1948: net income, $285,-624, equal to $1.85 a share, against $472,-148, or $3.07 a share, in the previous year.

Phillips Petroleum Co., Bartlesville, Okla. For 1948: consolidated net income, $72,630,997, equal to $12.01 each on 6,046,-000 common shares, compared with $40,-893,647, or $8.11 each on 5,044,000 shares, the year before.

Pittsburgh Plate Glass Co., Pittsburgh, Pa., and subsidiaries. Year ended December 31, 1948: net income, $32,748,900, a new high and equal to $3.65 each on 8,980,182 capital shares, contrasted with $27,771,-144, or $3.11 each on 8,939,622 shares, in the previous year; net sales, $280,037,351 (another record), against $262,529,489; income taxes, $21,200,000, against $25,000,000.

Rohm & Haas Co., Philadelphia, Pa. Year ended December 31, 1948: earnings, $4,289,922, equal to $5.25 each on 769,229 common shares, against $3,829,369, or $4.61 a share, the year before; sales, $62,419,158 (a new high), against $52,842,057.

St. Joseph Lead Co., New York, N. Y., and domestic subsidiaries. For 1948: net income, $9,636,737, equal to $5.61 each on 1,975,456 capital shares, contrasted with $12,537,761, or $6.35 a share, in 1947; net sales, $80,210,503 against $76,609,999; income taxes, $3,776,836, against $4,479,658.

Skelly Oil Co., Kansas City, Mo. For 1948: net income, $38,914,350, a record figure and equal to $36.04 each on 1,079,476 shares outstanding, contrasted with $21,090,-936 or $21.49 each on 981,341 shares, a year earlier; taxes, $10,670,000, against $6,713,-000.

Raybestos-Manhattan, Inc., Passaic, N. J., and domestic subsidiaries. For 1948: net earnings, $2,563,409, equal to $4.08 a common share, compared with $2,335,755, or $3.72 a share, in 1947; net sales, $57,-331,789, against $58,308,929; taxes, $2,441,-194, against $2,890,679; reserve for contingencies, $0, against $625,000; inventories at year-end, $10,198,055, against $9,152,997; current assets, incluing $5,043,040 cash, $21,762,456, against $5,854,661 and $21,301,-858, respectively; current liabilities $5,501,-330, against $5,475,238.

Seiberling Rubber Co., Akron, O., and subsidiaries. For 1948: net income, $467,-758, equal to 74¢ each on 301,010 common shares, compared with $421,614, or 58¢ a share, in 1947; net sales, $28,414,291, against $32,116,490; provision for income taxes, $267,000, against $310,000; inventories, $6,856,830, against $5,514,739; current assets, including $1,319,473 cash, $11,695,768, current liabilities, $3,127,032, against $1,444,657, $11,281,718, and $4,-621,658 respectively, on December 31, 1947.

Seiberling Rubber Co. of Canada, Ltd., Toronto, Ont. For 1948: net profit, $90,514, equal to $1.81 a common share, against $166,050, or $3.32 a share, in 1947; current assets, $1,927,778, current liabilities, $642,-259.

Socony-Vacuum Oil Co., Inc., New York, N. Y. For 1948: consolidated net income, $132,800,055, equal to $4.18 each on 32,332,015 capital shares, contrasted with $97,708,927, or $3.13 a share, in the preceding year.

Timken Roller Bearing Co., Canton, O., and consolidated subsidiaries. For 1948: net profit, $13,204,767, equal to $5.45 a share, compared with $11,124,252, or $4.59 a share, a year earlier; federal income taxes, $9,370,000, against $7,573,053.

United Carbon Co., Inc., Charleston, W. Va., and subsidiaries. For 1948: net income, $3,113,367, equal to $3.91 a share, against $3,159,138, or $3.97 a share, in 1947; reserve for contingencies, $400,000, against $300,000.

Union Asbestos & Rubber Co., Chicago, Ill. For 1948: net income, $1,432,-924, a new high and equal to $2.89 each on 495,376 capital shares, compared with $1,223,418, or $2.47 each on 494,376 shares, the year before; net sales, $12,182,015 (another record), against $8,876,371; federal income taxes, $890,000, against $705,000.

S. S. White Dental Mfg. Co., Philadelphia, Pa., and subsidiaries. For 1948: net income, $1,316,055, equal to $4.40 a share, against $1,232,690 or $4.12 a share, in 1947; net sales, $19,220,793, against $19,-342,319.

Trade Lists Available

The Commercial Intelligence Branch, United States Department of Commerce, Washington, D. C., recently compiled the following trade lists, of which mimeographed copies may be obtained by American firms from this Branch and from Department of Commerce field offices at $1 a list for each country.

Automotive Equipment Importers & Dealers—Cuba; Denmark; Ecuador; Israel; Italy; Panama; Philippine Islands; Surinam; Switzerland; Trinidad; Turkey; Uruguay; Venezuela.

Automotive-Product Manufacturers—Denmark; Greece; Italy.

Boot & Shoe Importers & Dealers—Bahamas; El Salvador; Surinam.

Boot & Shoe Manufacturers—Algeria; Italy; Paraguay; Surinam.

Chemical Importers & Dealers—Nicaragua; Peru; Portuguese East Africa; Siam; Uruguay; Venezuela.

Electrical Supply & Equipment Importers & Dealers—Peru.

Machinery Importers & Distributers—Cuba; United Kingdom.

Office Supply & Equipment Importers and Dealers—Algeria; Argentina; Austria; France; Paraguay.

Plastic End-Product Manufacturers & Exporters—Japan.

Plastic-Material Manufacturers, Molders, Laminators, & Fabricators of Plastic Products—Mexico; Siam; Uruguay.

Rubber-Goods Manufacturers—Australia; Bolivia; British Malaya; Denmark; Finland; Peru; Western Germany.

Rubber Growers & Exporters—British Malaya.

Rubber Stamp & Stencil (Mimeograph) Manufacturers—New Zealand.

Sporting Goods, Toy, and Game Importers & Dealers—Indo-China; Siam; Surinam.

Sporting Goods, Toy, & Game Manufacturers—Mexico.

Suspender, Brace, & Garter Manufacturers—Bolivia.

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
American Hard Rubber Co.	Com.	$0.25	Mar. 31	Mar. 16
	7% Pfd.	1.75 q.	Mar. 31	Mar. 16
Armstrong Rubber Co.	"A & B"	0.25	Apr. 1	Mar. 25
	Pfd.	0.59⅜ q.	Apr. 1	Mar. 25
Borg Warner Corp.	Com.	1.00 q.	Apr. 1	Mar. 17
Canadian General Electric Co., Ltd.	Com.	2.00 q.	Apr. 1	Mar. 19
Crown Cork & Seal Co., Inc.	Com.	0.50 q.	May 16	Apr. 15
Denman Tire & Rubber Co.	Com.	0.05 q.	Apr. 1	Mar. 20
	Pfd.	0.12½ q.	Apr. 1	Mar. 20
Detroit Gasket & Mfg. Co.	Com.	0.12½	Apr. 25	Apr. 11
Electric Storage Battery Co.	Com.	0.75	Mar. 31	Mar. 15
Faultless Rubber Co.	Com.	0.50	Apr. 1	Mar. 15
Firestone Tire & Rubber Co.	Com.	1.00	Apr. 20	Apr. 5
Garlock Packing Co.	Com.	0.25 q.	Mar. 31	Mar. 18
General Cable Corp.	Com.	0.25	May 2	Mar. 25
	1st Pfd.	1.00 q.	Apr. 1	Mar. 25
	2nd Pfd.	0.50 q.	Apr. 1	Mar. 25
General Electric Co.	Com.	0.50	Apr. 25	Mar. 18
General Tire & Rubber Co.	4½% Pfd.	1.06¼ q.	Mar. 31	Mar. 21
	3¾% Pfd.	0.93¾ q.	Mar. 31	Mar. 21
	3¼% Pfd.	0.81¼ q.	Mar. 31	Mar. 21
B. F. Goodrich Co.	Pfd.	1.25 q.	Mar. 31	Mar. 10
	Com.	1.00	Mar. 31	Mar. 10
Goodyear Tire & Rubber Co. of Canada, Ltd.	Com.	1.00	Apr. 1	Mar. 10
Jenkins Bros.	Com.	0.25	Mar. 31	Mar. 18
	Fdrs. Shrs.	1.00 red.	Mar. 31	Mar. 18
	Pfd.	1.75 q.	Mar. 31	Mar. 18
Mansfield Tire & Rubber Co.	$1.20 Conv. Pfd.	0.30 q.	Apr. 1	Mar. 15
	Com.	0.25 q.	Mar. 31	Mar. 10
Midwest Rubber Reclaiming Co.	4½% Pfd.	0.56¼ q.	Apr. 1	Mar. 14
Pharis Tire & Rubber Co.	Liquidating	1.00	Mar. 28	Mar. 21
Seiberling Rubber Co.	"A" Pfd.	1.25 q.	Apr. 1	Mar. 15
	4½% Pr. Pfd.	1.13 q.	Apr. 1	Mar. 15

OBITUARY

Eric Burkman

THE secretary of United States Rubber Co., New York, N. Y., Eric Burkman, died February 26 while on vacation in the Virgin Islands. The executive's sudden death was caused by coronary thrombosis.

Mr. Burkman was born May 3, 1892, in Elizabeth, N. J., and attended elementary and high schools in that city. While still an undergraduate at Elizabeth High School, in 1906, he began his business career in the general stores department of the Central Railroad of New Jersey. In 1912 he became associated with the Union Pacific-Southern Pacific System in New York and in 1913 was assigned to the office of Charles B. Seger, then vice president and comptroller of the railroad.

In 1919, when Mr. Seger was elected president of the rubber company, Mr. Burkman accompanied him and was appointed secretary of the operating council. He was made assistant to the president three years after that and continued as such until 1929 when a new president was elected. At that time Mr. Burkman became secretary of the corporation. He was also, during his career, secretary of the board of directors, the executive committee and the finance committee, a director of Latex Fibre Industries, Inc., Beaver Falls, N. Y., of Frank W. Gorse Co., Inc., and Dominion Rubber Co. Ltd., all divisions of U. S. Rubber.

Mr. Burkman was treasurer and a member of the board of governors of the Metropolitan Club of New York, a director of the West Side Association of Commerce, Inc., and a member of the Westchester Country and Baltusrol Golf Clubs.

Surviving the deceased are his wife, two daughters, a son, and a sister.

Funeral services were held March 2 at the Campbell Funeral Home, New York, followed by burial in Evergreen Cemetery, Elizabeth.

William T. Exton

WILLIAM T. EXTON, 61, who retired last year, because of ill health, as general manager of the rubber division of Ball Brothers Co., Inc., Muncie, Ind., which division he had established upon joining the company in 1933, died suddenly on March 15. Funeral services were on March 18 at Meeks Mortuary, Muncie, followed by interment at Riverview Cemetary, Trenton, N. J.

Mr. Exton was a native of Trenton. He began his long association with the rubber industry working for the Hamilton Rubber Co. when he was 16. In 1912 he moved to St. Louis, Mo., to establish the rubber division of The Cupples Co. He remained with this company until 1929, when he joined the Crunden Martin Mfg. Co. and installed its rubber division. For a short period before joining Ball Brothers the deceased was associated with Jenkins Bros. Co., Bridgeport, Conn., in an advisory capacity.

Mr. Exton, who was a former member of the Chicago, New York, and Detroit Rubber groups, also belonged to the Masonic Lodge, Muncie Commandery 18, Knights Templar, the Congregational Church at Webster Groves, Mo., and the Delaware Country Club.

He is survived by his wife, three daughters, a son, three sisters, and 11 grandchildren.

George Winters

THE vice president of La Favorite Rubber Mfg. Co., Paterson, N. J., George Winters, died on January 21. Officially retired since 1946, he had been with the company since February 13, 1899.

Born in Paterson, April 6, 1870, he attended local elementary schools and Latimer's Business College. Before beginning his career in the rubber industry he was associated with the Japanese Fan Co. in New York and the Nicholson File Co. in Paterson. Prior to becoming secretary and assistant treasurer of La Favorite in April 1927, he had been bookkeeper and purchasing agent for the firm. He was named a vice president upon his retirement.

Mr. Winters was a charter and an honorary member of the Purchasing Agents Association, for 15 years treasurer of the Captain Abram Godwin Chapter of N. J., Sons of the American Revolution, a member of the New Jersey Society of Colonial Wars, Federal Hall Memorial Association of New York, Demarest Family Association, Valley Forge Memorial Association, and Bill of Rights Commemorative Association. Mr. Winters was also only honorary member of Virginia State Society, S.A.R., councillor general of National Federation of Hugenots Society, vice president for 10 years of Passaic County Historical Society, and vice president general of Sons of American Revolution, National Society.

Louis G. Chauvin

THE general manager of Stedfast Rubber Co. (Canada), Ltd., Granby, P. Q., Canada, Louis G. Chauvin, died on February 23 from a heart attack. Prior to joining Stedfast in November, 1940, he had been with F. S. Carr Co., Framingham, Mass., as superintendent and with Federal Leather Co., Newark, N. J., also as superintendent.

Mr. Chauvin was born in Boucherville, P. Q., in 1880.

Funeral services took place at Granby, February 25, followed by burial in that city.

Surviving the deceased is his wife.

Leo V. Kenward

LEO VICTOR KENWARD, former chief of the rubber products group of Dunlop Rubber Co., Ltd., London, England, died suddenly on February 23 at Sussex. At the time of his death he was a vice president and a Fellow of the Institution of the Rubber Industry and a vice president of the Research Association of British Rubber Manufacturers.

In 1907 he joined Dunlop in London, but was transferred to Aston Cross, Birmingham, four years later. Mr. Kenward was named works secretary in 1919, operating superintendent and work secretary at Fort Dunlop in 1923, and general sales manager in 1924. From 1926 to 1928 he was sales controller at Dunlop's London headquarters and was largely responsible for the coordination of the Macintosh group when it was acquired by Dunlop in 1926. Mr. Kenward was made general manager of Dunlop's subsidiary companies in 1930 and director of the rubber products group in January, 1940. He retired from business in 1942.

Mr. Kenward was also chairman of the India Rubber Manufacturers' Association from 1929 to 1933; the first president of the Federation of British Rubber Manufacturers' Association (1942); the first chairman of the Fort Dunlop Joint Factory Council, a member of the executive committee of the Rubber Export Group; and, at the time of his death, vice chairman of the Midland Employers' Mutual Assurance.

Born June 20, 1886, at St. Leonards-on-Sea, the deceased was educated at Tudor Hall, Kent.

Funeral services were held February 26, followed by burial at Cuckfield.

Surviving are the widow, a son, and a daughter.

Auto Top Fabric

(*Continued from page 78*)

solution available in each of the five standard and highly sun-resistant colors of the fabric: black, tan, maroon, light gray, and dark gray.

The new material is now available through distributers in various parts of the country. Welting and binding material for use with the new fabric is being manufactured and distributed by Backstay Welt Co., Union City, Ind.

Reinforced Plastic

THE availability in pilot-plant quantities of rod and bar stock of a new reinforced plastic has been announced by Richard J. Francis, Granville, O. Tests on one formulation indicate unusually high mechanical properties. Of special interest to the design engineer is the apparent absence of a yield point and the straightness (indicating true elasticity) of the stress-strain curve which reportedly are obtained with this material.

Average test results follow: tensile strength, 125,500 p.s.i.; compressive strength (endwise), 84,300 p.s.i.; flexural strength, 131,600 p.s.i.; Izod impact strength, 13.7 ft.-lbs.; flexural modulus of elasticity, 5.83 x 10^6 p.s.i.; torsional resistance, 60 in.-lbs.; and specific gravity, 1.8. Besides these mechanical properties, the plastic bars and rods also possess resistance to heat and cold; low moisture absorption; and favorable electrical properties, including relatively high arc resistance and dielectric strength and fairly low dielectric loss factor.

Socfin Rubbers from Latex Distributors, Inc.

IN OUR March issue on page 739, under the heading "Natural Rubber from Socfin," it was stated that special grades of natural rubber by Socfin Co., Ltd., Kuala Lumpur, British Malaya, could be obtained from the company's New York office at 200 W. 58th St. We have since been informed that these rubbers, of which "Plastorub" is available at the present time, will be distributed in the U.S.A. by Latex Distributors, Inc., of Baltimore and New York, who have been handling Socfin centrifuged latex for some time.

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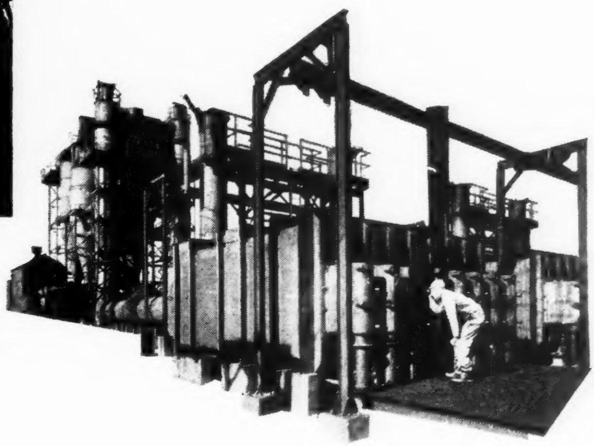
... to meet your needs

Night and day millions of tiny flames deposit carbon upon steel channels to produce Continental channel blacks.



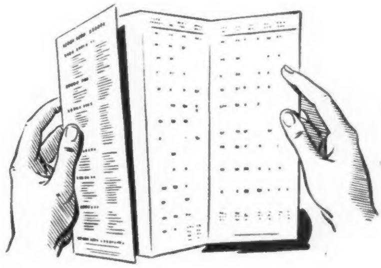
Carefully controlled burning conditions in furnaces such as these insure uniformly high quality Continex furnace blacks.

Continental Carbon Company manufactures a complete line of high quality carbon blacks to meet the most exacting requirements of the rubber, paint, ink, plastics, paper and other industries. In every important classification of channel or furnace black, there is a Continental or Witco product at your service.

Samples of Witco and Continental carbon blacks are available for evaluation by your own technical staff. The new data sheet offered below will help you in requesting the samples suited to your needs.

New Data Chart on Continental & Witco Carbon Blacks...

Send for the quick reference chart of leading carbon blacks and their important properties. It will save you time and assist you in selecting carbon blacks for your specific requirements.



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Patents and Trade Marks

APPLICATION

United States

2,460,269. **Body Air Conditioning Device, Including Interconnected Flexible Air Conduits Conformable to the Contours of the Body.** W. R. Appeldoorn, Detroit, Mich.

2,460,304. **Electrical Cable Connector, Including a Cylindrical Outer Shell in Which Is Seated a Removable, Compressible, Resilient Dielectric Body Formed with a Central Bore for Slidably Receiving the Cable Conductor.** K. McGee, Dayton, and H. D. Vanderpool, Springfield, both in O., assignors to the United States of America, as represented by the Secretary of War.

2,460,479. **Catheter.** A. L. Smith, Savannah, Ga.

2,460,586. **In an Engine Having Cylinders Spaced Along Its Crankshaft, a Three-Point Suspension of Rubber Sandwich Mountings Arranged Transverse to the Crankshaft.** W. A. Keetch, assignor to Lord Mfg. Co., both of Erie, Pa.

2,460,596. **In a Support Including Crossed Load Supporting Arms Having as Load Transmitting Connections at One End of Each Arm Torsion Joints Including Opposed, Movable Joint Members, an Element of Rubber-Like Material between and Fixed to the Joint Members.** P. C. Roche, assignor to Lord Mfg. Co., both of Erie, Pa.

2,460,628. **In a Flexible Coupling for Transmission Shafts in Series, Soft Rubber-Like Cushioning Material in Torque-Transmitting Assemblies Mounted on a First Coupling Member.** T. L. Fawick, Akron, O.

2,460,629. **In Planetary Gearing, All-Direction-Cushioning Means Individual to the Planet Gears and Consisting of Material Having the Resilient Deformability of Soft Vulcanized Rubber.** T. L. Fawick, Akron, O.

2,460,630. **In a Gear, Torque-Cushioning Members Having the Resilient Deformability of Soft Vulcanized Rubber.** T. L. Fawick, Akron, O.

2,460,645. **Compressible Safety Razor Cushion.** W. P. MacMicking, Minneapolis, Minn.

2,460,682. **In a Vacuum Cleaner Body, Including a Motor-Fan Unit, a Rubber Supporting Ring over One End of the Unit and Rubber Sandwiches Affixed at One Side to the Other End of the Unit.** F. C. Doughman, Darien, assignor to Electrolux Corp., Old Greenwich, both in Conn.

2,460,768. **Basin Plug Stopper or the Like, of Compressible Material.** G. A. Riley, assignor to H. O. Canfield Co., both of Bridgeport, Conn.

2,460,853. **Fastening Device, Including a Tubular Slotted Element of Resilient Material, an Inflatable Tubular Element Adapted to Be Inserted into the Slotted Element, and Inflating Means.** P. A. Siple, United States Army, Arlington, Va.

2,460,912. **Bridle Bit of Molded Polymeric Plastic.** A. E. Wagner and F. E. Camp, assignors to Plas-Tk-Bits, Inc., all of Meadville, Pa.

2,460,955. **In an Inhaler, an Annular Ring of Elastic Material Arranged in a Grooved Base Member and Holding in Place a Cylindrical Cover Member.** P. H. Todd, Kalamazoo, Mich.

2,460,981. **In a Pipe Connection, Resilient Rubber-Like Means Having Preformed Internal Groove Means Adapted to Receive Beads at the Ends of a Pair of Pipes to Be Secured in End-to-End Relation.** W. H. Francisco, Jr., Bloomfield, N. J., E. C. Steiner, Dallas, Tex., and H. C. Hill, Pasadena, Calif., assignors to Wright Aeronautical Corp., a corporation of N. Y.

2,460,981. **In a Pipe Connection, Resilient Rubber-Like Means Having Preformed Grooves Adapted to Receive Beads at the Ends of a Pair of Pipes to Be Secured in End-to-End Relation.** H. C. Hill, Montclair, and E. H. Francisco, Bloomfield, both in N. J., assignors to Wright Aeronautical Corp., a corporation of N. Y.

2,461,062. **Sanitary Mattress Enclosed in a Waterproof Cover Which Has Openings in Alinement with Vertical Openings in the Mattress.** C. B. Kane, Greenwich, Conn.

2,461,072. **Rubber Meteorological Balloon or Similar Hollow Rubber Article.** D. J. Miller, assignor to American Anode, Inc., both of Akron, O.

2,461,096. **Self-Sealing Gasoline Tank, Including an Inner Metallic Tank, a Flexible Outer Tank, a Sealant under Compression between the Tanks and Endless Resilient Tubular Elements between the Tanks to Maintain Them in Spaced Relation and Provided with Slots through Which the Sealant May Pass.** H. P. Wagner, Akron, O.

2,461,169. **V-Type Power Transmission Belt, Including a Flexible Member of Block Rubber Centrally Connecting Top and Base Portions of the Belt and a Suitable Fluid Material Between the Block Rubber and Top and Converging Side Portions.** E. A. Miller, Fairfield, Conn.

2,461,200. **Waterproof Shipping Container.** H. J. Grampp, Kenvil, N. J., assignor to Hercules Powder Co., Wilmington, Del.

2,461,257. **Cushion Vehicle Wheel.** G. M. Brandon, Tallahassee, Fla.

2,461,481. **In a Hypodermic Syringe, a Rubber Plug in Which the Inner End of the Needle Is Normally Embedded.** Z. M. Roehr, assignor to Roberts Mfg. Co., both of New York, N. Y.

2,461,594. **Flexible Hose for Handling Heated Fluids.** J. M. Flounders, Cuyahoga Falls, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,461,626. **Tie Rod Joint, Including a Socket Having a Resiliently Backed Plastic Material Bearing Wall.** J. H. Booth, Detroit, Mich., assignor to Thompson Products Inc., Cleveland, O.

2,461,654. **High-Speed Belt.** E. Nassimbene, assignor to Gates Rubber Co., both of Denver, Colo.

2,461,656. **In a Coupling Device to Conduct a Fluid under Pressure from One Conduit to Another and Including a Flexible Hose Provided at One End with a Fitting, a Reversible Rubber Adapter for the Fitting.** G. A. Norman, Des Moines, Iowa.

2,461,849. **For a Self-Laying Track-Type Vehicle, a Track Including a Flexible Band of Rubber-Like Material Having Marginal Runner Portions for Supporting Bogie Wheels from the Ground Directly through Such Portions.** C. O. Slemmons, South Bend, Ind., and R. W. Smith, Copley, O., assignors to B. F. Goodrich Co., New York, N. Y.

2,461,880. **Resilient Back Rest with a Casing of Water-Resisting Material and Straps Provided with Suction Cups.** F. J. Curran, Downers Grove, Ill., assignor to Curran Cushion & Textile Co., a corporation of Ill.

2,461,969. **Vibration Absorbing Support of Rubber.** H. M. Dodge, Wabash, Ind., assignor to General Tire & Rubber Co., Akron, O.

2,462,004. **Cushion of Soft Foam Rubber.** A. Rothery, Springfield, Mass.

2,462,011. **Annular One-Piece Rubber Cushioning Unit.** L. F. Thiry, Montclair, N. J., assignor to General Tire & Rubber Co., Akron, O.

2,462,161. **Hose Supporter.** H. F. Callis, Norfolk, Va.

2,462,185. **Moistureproof, Heat Sealable Wrapping Material Including a Base Film of Cellulose, a Continuous Subcoating of a Resinous Aliphatic Ether Derivative of a Methylol Melamine and Nitrocellulose, and a Top Coating of a Vinylidene Chloride-Acrylonitrile Copolymer.** P. M. Hauser, Kenmore, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,462,189. **For Windshield Cleaners, a Valve Including a One-Piece Molded Rubbery Body.** W. C. Hess, assignor to Trico Products Corp., both of Buffalo, N. Y.

2,462,195. **Maternity Panty Garment with Highly Elastic Elements Connected with a Front Panel.** I. W. Jackobson, assignor to Knickernick, Inc., both of Minneapolis, Minn.

2,462,208. **Finger Tip of Elastic Rubber-Like Material Shaped with Roughening Members.** W. Meyer, assignor to M. T. Cole, both of Chicago, Ill.

2,462,643. **In an Endless Track Including Pairs of Links from the Surface of Which a Member Projects, a Tubular Encasement of Resiliently Deformable Material Surrounding This Member.** P. H. Johnson and L. W. Tripp, assignors to Roadless Traction Ltd., all of Hounslow, Middlesex, England.

2,362,679. **Rainproof Headwear.** I. E. Rosenau, Seattle, Wash.

2,462,711. **In Combination with a Bicycle Fork for the Front Wheel, a Rocker Provided with a Rubber Cushion to Stop Resiliently the Upward Movement of the Rear Portion of the Rocker.** W. W. Barnett, Clovis, N. Mex.

2,462,748. **In a Pipe Plug Including a Rigid Sleeve Insertable in One End of the Pipe, an Expansible Rubber Sleeve Secured at One End to the Rigid Sleeve and at the Other to a Plug.** J. Johnson, Grand Forks, N. D.

2,462,786. **Infant's Pacifier.** N. P. Steckler, New York, N. Y.

2,362,822. **In a Variable Inductance Assembly Including a Tubular Coil Form and a Threaded Core Member Movably Positioned within the Coil Form, a Resilient Plastic-Like Tubular Insert between the Core Member and the Form.** F. Wood, Elmhurst, Ill., assignor to Zenith Radio Corp., a corporation of Ill.

Dominion of Canada

454,274. **A Thermoplastic, Water-Impervious Bonding Agent as the Sole Bonding Agent for the Marginal Edges of a Glove of Non-Plastic Material.** J. Shmikler, Champaign, Ill., U.S.A.

454,327. **Syringe Bag of Cured Plastic Material.** C. J. Crowley, assignor to Seamless Rubber Co., both of New Haven, Conn., U.S.A.

454,332. **Windshield Wiper.** A. C. Scinta, assignor to Trico Products Corp., both of Buffalo, N. Y., U.S.A.

454,368. **Tire Structure in Which Thin Flat Aluminum Filaments Extend from One Bead Portion to the Other and Have Their Ends in Heat Conducting Relations with the Metallic Cables in the Beads.** J. L. Reynolds, Richmond, Va., U.S.A.

454,439. **Bag of Rubber Hydrochloride Film.** J. E. Snyder, assignor to Wingfoot Corp., both of Akron, O., U.S.A.

454,444. **A Thermoplastic Strip Bonded to the Body of a Hat and to the Sweatband.** J. J. Cartledge, Guelph, Ont.

454,450. **In a Sudorific Garment, an Envelope of Elastic Tissue Clinging as Closely as Possible to the Skin of the Wearer, Valves Insuring Elimination of Perspiration.** L. L. S. M. Lambergeon, Paris, France.

454,463. **Rotary Shaft Seal Including a Plurality of Cup Shaped Rings of Flexible Oil-Resistant Material.** S. H. Mortensen and W. F. King, Wauwatosa, assignors to Allis-Chalmers Mfg. Co., Milwaukee, both in Wis., U.S.A.

454,483. **Inflatable Catheter Including a Balloon Sac and an Inflation Tube therefor Embedded in the Wall of the Body Portion of the Catheter.** J. M. Auzin, assignor to Davol Rubber Co., Providence, R. I., U.S.A.

454,493. **Flexible Tire Vulcanizer Cover.** H. T. Kraft, assignor to General Tire & Rubber Co., both of Akron, O., U.S.A.

454,502. **Aircraft Propeller, Including a Molded Body of Resin and Fabric.** R. N. Hartzell, assignor to Hartzell Industries, Inc., both of Piqua, O., U.S.A.

454,538. **Windshield Wiper for Curved Surfaces Having a Body of Rubbery Material.** A. C. Scinta, Buffalo, and A. Rappl, Eggertsville, assignors to Trico Products Corp., Buffalo, both in N. Y., U.S.A.

454,633. **Ground Grip-Type Tire Tread.** J. G. Kreyer, deceased, in his lifetime of Akron, O., assignor to Firestone Tire & Rubber Co., Akron, O., U.S.A.

454,643-644. **Apparatus to Prevent Accumulation of Ice on the Leading Edge of an Airfoil, which Includes a Covering of Rubber-Like Material Having Inflatable Passages.** E. E. Heston, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y., U.S.A.

United Kingdom

615,283. **Windscreen Wipers.** Trico-Folberth, Ltd., and C. A. Bayes.

615,368. **Windscreen Wipers.** Trico-Folberth, Ltd., and H. B. Pyne.

615,405. **Molded Products.** Cie. Nationale de Matieres Colorantes & Manufactures de Produits Chimiques du Nord Reunies, Etablissements Kuhlmann, and G. Passelecq.

615,540. **Resilient Couplings for Shafts.** Metalastik, Ltd., and A. J. Hirst.

615,965. **Resilient Suspension of Engines.** Metalastik, Ltd., and A. J. Hirst.

615,743. **Wheel Brakes.** Firestone Tire & Rubber Co.

616,127. **Draught Excluders for Doors.** High Speed Service Tool Co., Ltd., and J. A. Michie.

616,200. **Insulation of Electric Inductive Apparatus.** British Thomson-Houston, Ltd.

616,212. **Pipe-Clips and Rubber-Lined Vats Provided therewith.** Dunlop Rubber Co., Ltd., and E. W. Jones.

616,213. **Diving Masks.** P. R. Dubois.

616,299. **Vehicle Suspension.** B. F. Goodrich Co.

616,299. **Adhesives.** A. H. Stevens (Chrysler Corp.).

616,457. **Rubber Suspension System for the Bogies of Railway and Like Vehicles.** Metalastik, Ltd., A. J. Hirst, A. F. Collins, and F. Dickson.

616,577. **Windshield Wiper.** Trico Products Corp.

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BEACOFINISH—a unique family of coating materials conceived to give your products greater durability and eye appeal. These highly concentrated wax emulsions that can be diluted with up to four parts of water can be used with the utmost safety and economy.

BEACOFINISH is therefore of four-fold importance to you:—

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2. ***It Improves*** the appearance of your product for its uniform coating stimulates greater consumer interest.
3. ***It's Economical*** because its high dilution potential (without losing efficiency) allows one gallon to cover 15,000 sq. ft.
4. ***It's Safe*** being a wax in water emulsion, it eliminates the fire and health hazards of volatile-solvent based finishes.

BEACOFINISH can be applied by dipping, sponging, spraying or brushing—dries in about 20 minutes—faster if force-dried—to give a hard protective coating of great elasticity.

BEACOFINISH may be ordered in Neutral or Black, in varying degrees of luster from brilliant to dull. It is so concentrated, from one drum you can obtain potentially up to five drums of superior coating for your products.

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774 St. PAUL ST. W., MONTREAL

PROCESS

United States

2,460,367. **Rubber-Bonded Abrasive Articles.** D. B. Sharpe, North Tonawanda, assignor to Carborundum Co., Niagara Falls, both in N. Y.

2,460,820. **Containers with Permanent Rubber Liner.** V. Hagopian, New York, N.Y.

2,461,089. **Continuous Process for Making an Improved Granular Aminoplast Resin Composition for Molding.** L. Smidth, New York, N. Y.

2,461,192. **Reclaiming Vulcanized Butadiene Rubber.** F. H. Banbury, Woodmont, D. A. Comes, Woodbridge, and C. F. Schnuck, New Haven, all in Conn., assignors to Lancaster Processes, Inc., New York, N. Y.

2,461,193. **Treating Waste Rubber Stock Having Unvulcanized Butadiene Rubber as a Component.** F. H. Banbury, Woodmont, D. A. Comes, Woodbridge, and C. F. Schnuck, New Haven, all in Conn., assignors to Lancaster Processes, Inc., New York, N. Y.

2,461,975. **Flattened Thermoplastic Tubing of Predetermined Desired Characteristics.** E. D. Fuller, assignor to Visking Corp., both of Chicago, Ill.

2,461,976. **Flattened Thermoplastic Tubing of Predetermined Desired Characteristics.** B. H. Schenk, Western Springs, assignor to Visking Corp., Chicago, both in Ill.

2,462,149. **Treatment of Cable Insulated with Thermoplastic Material.** J. K. Webb, London, England, assignor by mesne assignments to International Standard Electric Corp., New York, N. Y.

2,462,645. **Treating Rubber Tire Scrap in Order to Separate the Rubber and the Fabric Components.** T. M. Knowland, Belmont, assignor to Boston Woven Hose & Rubber Co., Cambridge, both in Mass.

United Kingdom

615,223. **Manufacturing Polymerized Products in a Mold.** Chemische Fabrik Schonenwerd H. Erzinger A.G.

615,671. **Electric Insulating Bushings, Tubes, Etc.** Metropolitan Vickers Electrical Co., Ltd., A. R. Dunton, and R. P. Cartwright.

615,849. **Tire Retreading.** Dunlop Rubber Co., Ltd., and A. L. Adams.

615,985. **Building up Polymerization Products in a Mold.** Chemische Fabrik Schonenwerd H. Erzinger A.G.

616,115. **Joints for Pipes Made of Thermoplastic Resin Materials.** Imperial Chemical Industries, Ltd., and G. C. Tyce.

CHEMICAL

United States

2,460,291. **Preparation of Terpene Alcohols having a Plurality of C_5H_8 Units in the Molecule by Treating Isoprene with Dichloroacetic Acid.** M. Hunt, Claymont, Del., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,460,300. **Vulcanizable Polymeric Material from a Monovinyl Aromatic Compound and a Conjugated Aliphatic Diolefin.** W. J. Le Fevre and K. C. Harding, assignors to Dow Chemical Co., all of Midland, Mich.

2,460,393. **Vulcanizing Rubber with the Aid of a Primary Organic Accelerator and an Activator of the Formula Aryl-S-NH-R, Where Aryl Is a Carbocyclic Ring Having a Nuclear Carbon Atom Directly Bonded to the S, Which Nucleus Is Further Substituted by a Group More Electro-Negative Than Hydrogen from the Class of Halogen, Nitro, Acyl, Carboxyl, Carboxy Ester, Sulfonamide and Acylamide, and R Is from the Group of Aliphatic and Aromatic Hydrocarbon Groups.** P. T. Paul, Naugatuck, Conn., assignor to United States Rubber Co., New York, N. Y.

2,460,457. **Organo-Substituted Siloxane Polymers.** J. F. Hyde, assignor to Corning Glass Works, both of Corning, N. Y.

2,460,485. **Flexible Wrinkle-Coating Consisting of a Mixture of Unsaturated Fatty Oil, Varnish Solvent, and a Solution of Polyvinyl Chloride.** N. T. Beynon, Dayton, O., assignor to New Wrinkle, Inc., Wilmington, Del.

2,460,536. **Reacting Vinyl Cyanide with a Compound Containing a Reactive Methylene Group in the Presence of an Alkaline Catalyst.** A. O. Rogers, Lewiston, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,460,565. **Vapor Phase Chlorination of Phthalic Anhydride.** T. A. Amacker, Baton Rouge, La., assignor to B. F. Goodrich Co., New York, N. Y.

2,460,567. **Polymerizing a Butadiene-1,3 Hydrocarbon in Aqueous Emulsion in the Presence of a Beta-(p-Alkyl Phenoxy)-Beta'-Mercapto-Diethyl Ether in Which the Alkyl Group Contains 4 to 12 Carbon Atoms.** G. L. Browning, Jr., Cleveland, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,460,574. **Chloroethylene Polymer Plasticized with a Dialkyl Chloro-Phthalate.** T. L. Gresham, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,460,578. **As a New Composition of Matter, a Polymer of Vinylidene Chloride Dissolved in an Amide Solvent.** R. C. Houtz, Snyder, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,460,579. **Solutions of Vinylidene Chloride Polymers in a Solvent Containing a Sulfoxy Group.** R. C. Houtz, Snyder, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,460,582. **Preparing a Water-Free Plasticized Polymer from a Mixture in Water of a Polymer of a Monomeric Material Including Predominantly a Chloroethylene.** A. B. Japs, Cuyahoga Falls, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,460,592. **Generation of Substantially Pure Monomeric Formaldehyde from a Polymer of Formaldehyde.** A. R. Miller, Jr., Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,460,600. **Plastic, Unvulcanized Copolymer of Butadiene and Styrene in Which the Sole Softening and Plasticizing Agent Is Triethanolamine.** D. V. Sarbach, Cuyahoga Falls, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,460,603. **Preparing Alpha-Cyanoethyl Acetate.** W. L. Semon, Silver Lake Village, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,460,606. **Polymerizing Butadiene in an Aqueous Emulsion in Which the Sole Emulsifier Is Soap in the Presence of a Catalytic Amount of Creatine or Creatinine.** W. D. Stewart, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,460,724. **Thermoplastic Resins from an Oil Containing as Major Polymerizable Constituent Coumarone, Indene or Their Homologs; a Phenolic Reagent, and Formaldehyde, Heated together in the Presence of an Acid Catalyst.** H. L. Allen, Philadelphia, Pa., and E. G. Kerr, Haddonfield, N. J., assignors to Allied Chemical & Dye Corp., New York, N. Y.

2,460,788. **Preparing Methacrylonitrile and Alpha-Chloro Isobutyronitrile by Reacting Tri-Alpha-Cyanoisopropyl Phosphite with Chlorine and Pyrolyzing the Resulting Product.** Le R. U. Spence, Elkins Park, Pa., and E. H. Sakal, Brooklyn, N. Y., assignors to Rohm & Haas Co., Philadelphia, Pa.

2,460,795. **Making Rubbery Polymeric Organosiloxane Compositions with the Aid of Benzoyl Peroxide.** E. L. Warrick, Pittsburgh, Pa., assignor to Corning Glass Works, Corning, N. Y.

2,460,799. **Production of Organopolysiloxane Resins with the Aid of Aluminum Alkoxide.** A. J. Barry, assignor to Dow Chemical Co., both of Midland, Mich.

2,460,805. **Polymerization of Organopolysiloxanes with Acid-Activated Bleaching Earth.** E. C. Britton, H. C. White, and C. L. Moyle, assignors to Dow Chemical Co., all of Midland, Mich.

2,460,844. **Copolymer of Vinylidine Chlorofluoride and Acrylonitrile.** F. G. Pearson, Delaware Co., Pa., assignor to American Viscose Corp., Wilmington, Del.

2,460,962. **Plastic Insulating Composition, Including Heat Insulating Particles Individually Coated with a Pressure-Sensitive, Slightly Tacky Condensation Product of Zinc Chloride Heat-Treated Drying Oil and Oil-Soluble p-Tertiary Alkyl Phenol-Formaldehyde Resin.** M. R. Ximenez, Fanwood, J. H. Ferguson, Somerville, and S. C. Bunce, Plainfield, all in N. J., assignors to Johns-Manville Corp., New York, N. Y.

2,460,973. **Preparing Hydrocarbon Polymers from a Conjugated Aliphatic Diolefin Polymerized at below 0° C., Employing Anhydrous Hydrogen Fluoride as Catalyst in the Presence of a Halogenated Aliphatic Hydrocarbon Solvent.** J. D. Calfee and J. H. Pearson, both of Manhasset, N. Y., assignors to Allied Chemical & Dye Corp., a corporation of N. Y.

2,460,995. **Polyvinyl Alcohol Article Plasticized with an Amine Adduct of Butadiene Cyclic Sulfone.** C. W. Mortenson, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,460,996. **3-Chloromethacrylonitrile.** J. L. Mostek, Chicago, Ill., assignor to Sinclair Refining Co., New York, N. Y.

2,461,004. **Unsaturated Resin-Forming Hydrocarbon Material.** F. J. Soday, Baton Rouge, La., assignor to United Gas Improvement Co., a corporation of Pa.

2,461,301. **Polymerizable Chemical Having the Formula** $\begin{matrix}-CO-C_6H_5\\-COO-R\end{matrix}$ **Where R Is from the Class of Allyl and Methallyl Radicals.** P. O. Tawney, Passaic, N. J., assignor to United States Rubber Co., New York, N Y.

2,461,339. **Unsaturated Thioethers of Cyclic Sulfones.** R. C. Morris, Berkeley, J. L. Van Winkle, San Lorenzo, and E. C. Shokal, Oakland, assignors to Shell Development Co., San Francisco, all in Calif.

2,461,346. **Separating Isoprene from a Closely Boiling Mixture Containing C_5 Monoolefins.** J. A. Patterson, Beverly, N. J., assignor to Standard Oil Development Co., a corporation of Del.

2,461,349. **Composition from the Class of Butadiene Polymers, Butadiene-Acrylonitrile Copolymers, Isoprene Polymers, Chloroprene Polymers and Polyisobutylene Containing a Nitrile Produced by Reacting Abietic Acid and Ammonia at Elevated Temperature and Serving as a Plasticizer.** A. W. Ralston and H. M. Corley, assignors to Armour & Co., all of Chicago, Ill.

2,461,358. **Production of Aqueous Emulsion Polymerizates of Mixtures of Butadiene and an Acrylic Nitrile in the Presence of a Mixture of a Soap-Forming Fatty Acid and Ammonia, as Emulsifier.** B. M. Vanderbilt, Westfield, N. J., and F. Bascom, State Island, N. Y., assignors to Standard Oil Development Co., a corporation of Del.

2,461,362. **Preparation of 2-3 Methyl Butadiene 1-3.** D. W. Young, Roselle, and C. E. Britton, Elizabeth, both in N. J., assignors to Standard Oil Development Co., a corporation of Del.

2,461,383. **Copolymer of Methyl Alpha-Acetamino Acrylate and Acrylonitrile Produced by Heating a Solution Including One Part by Weight of Methyl Alpha-Acetamino Acrylate, 19 Parts Acrylonitrile, One Part Ammonium Persulfate, and 0.5-Part of Sodium Sulfite Dissolved in Water, at about 30° C. for about 16 Hours.** E. Isaacs and H. Gudgeon, both of Blackley, Manchester, England, assignors to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,461,492. **Acrylonitrile.** E. L. Carpenter, Riverside, and H. S. Davis, Greenwich, both in Conn., assignors to American Cyanamid Co., New York, N. Y.

2,461,495. **Resinous Polyamide Having a Unit Length of at Least 8.** D. E. Floyd, Minneapolis, Minn., assignor to General Mills, Inc., a corporation of Del.

2,461,508. **Friction Element Including Discrete Particles of Insoluble Furfuraldehyde Ketone Resin.** M. T. Harvey, South Orange, N. J., assignor to Harvel Research Corp., a corporation of N. J.

2,461,510. **Thermosetting Resin Produced from Furfuraldehyde and a Ketone.** M. T. Harvey, South Orange, N. J., assignor to Harvel Research Corp., a corporation of N. J.

2,461,523. **Dehydrofluorinating a Polyfluoroalkane.** D. D. Coffman and R. D. Cramer, assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.

2,461,531. **Vinyl Halide Resin Capable of Resisting Discoloration on Heating and Containing an Antimony Alkali Metal Tartrate.** F. W. Cox, Cuyahoga Falls, and J. M. Wallace, Jr., assignors to Wingfoot Corp., both of Akron, both in O.

2,461,551. **Composition Including a Rubbery Copolymer of Butadiene and Styrene and a Resin Occurring in Utah Resin-Bearing Coal.** E. D. Lee, Teaneck, and L. S. Engle, Harrington Park, both in N. J., assignors to Interchemical Corp., New York, N. Y.

2,461,552. **Adhesive Composition Including a Solution in an Organic Solvent of an Isobutene-Diolefin Rubbery Copolymer and a Resin Occurring in Utah Resin-Bearing Coal.** L. J. Radi, Union City, N. J., assignor to Interchemical Corp., New York, N. Y.

2,461,553. **Adhesive Composition Including a Solution in an Organic Solvent of a Chloroprene Rubbery Copolymer and a Resin Occurring in Utah Resin-Bearing Coal.** L. J. Radi, Union City, N. J., assignor to Interchemical Corp., New York, N. Y.

2,461,612. **Coloration of Polymerized Diallyl Phthalate Synthetic Resins, Which Includes Subjecting the Resins to the Action of a Dye in a Mixture of Glycerol and Water.** H. C. Olpin and A. J. Wesson, both of Spondon, England, assignors, by mesne assignments, to Celanese Corp. of America, a corporation of Del.

2,461,613. **Dispersions of Vinyl Chloride Resins as Coating Compositions.** R. W. Quarles, Pittsburgh, and C. I. Spessard, Leechburg, both in Pa., assignors to Carbide & Carbon Chemicals Corp., New York, N. Y.

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2,461,704. **Adhesive and Coating Composition Including Polymerized Linseed Oil, Chlorinated Rubber, Micro Crystalline Wax, Ethyl Acetate, and Toluene.** F. B. Speyer, Salem, Mass., assignor to Shellmar Products Corp., Mount Vernon, O.

2,461,735. **Heat Treatment of an Interpolymer of Styrene, Allylic Fumarate and Allylic Alcohol to Liberate "Free" Allylic Alcohol.** C. A. Heiberger, Nitro, W. Va., assignor to United States Rubber Co., New York, N. Y.

2,461,761. **Rigid Cellular Resin Material.** L. E. Nye, Elkhart, Ind., assignor to United States Rubber Co., New York, N. Y.

2,461,882. **Resinous Material from Furfuryl Alcohol Polymerized under Heat with Sulfur as the Catalyst, and under Neutral Conditions in the Presence of Water.** E. R. Dillehay, Glen Ellyn and R. D. Schuetz, Chicago, both in Ill., assignors to Richardson Co., Lockland, O.

2,461,942. **Lightweight, Soft, and Elastic Sponge Composition Including a Copolymer of Vinyl Chloride and an Alkyl Ester of Unsaturated Dicarboxylic Acid.** W. T. L. Ten Broeck, Jr., assignor to Wingfoot Corp., both of Akron, O.

2,461,943. **Alpha, Beta-Unsaturated Guanamines.** J. T. Thurston, Cos Cob, Conn., assignor to American Cyanamid Co., New York, N. Y.

2,461,953. **Compounding Copolymers of Butadiene and Styrene, Which Includes Slightly Precuring the Copolymer with a Fraction of the Amount of Sulfur Needed for Optimum Cure, Masticating the Mix, and Then Adding Additional Sulfur and Curing to a Soft Vulcanized State.** E. G. Bargmeyer, Mishawaka, Ind., assignor to United States Rubber Co., New York, N. Y.

2,461,954. **Butadiene-Styrene Copolymer Cements.** E. G. Bargmeyer, Mishawaka, Ind., assignor to United States Rubber Co., New York, N. Y.

2,461,963. **Rubber Hydrochloride Film Plasticized with 15 Parts Dibutyl Sebacate (by Weight) and 15 Parts of Methoxyethyl Oleate.** La E. Cheyney, assignor to Wingfoot Corp., both of Akron, O.

2,461,966. **Oxidizing a Polyisobutylene by Treating with a Mixture of Nitric Acid and Sulfuric Acid at about 240° F.** G. H. B. Davis, Elizabeth, N. J., assignor to Standard Oil Development Co., a corporation of Del.

2,461,990. **Polymers and Copolymers of Beta-Cyanoethyl-Propiolate.** J. G. Lichty, Stow, assignor to Wingfoot Corp., Akron, both in O.

2,462,013. **Stripping Emulsion Polymerization Latices of Unreacted, Slightly Water-Soluble Polymerizable Materials.** W. W. Waterman, Cranford, N. J., assignor to Standard Oil Development Co., a corporation of Del.

2,462,029. **Adhesive Composition Including Polymeric Material and a Potential Plasticizer therefor.** L. M. Perry, Nashua, N. H., assignor to Nashua Gummed & Coated Paper Co., Nashua, N. H.

2,462,054. **Liquid Polymer Resin Obtained by Heating a Mixture of Resorcinol and Furfuryl Alcohol in the Presence of an Alkali Catalyst.** J. Delmonte, Glendale, assignor, by direct and mesne assignments, of 72% to R. Hemphill, Los Angeles, both in Calif.

2,462,123. **Low Temperature Polymerization of Isobutylene and Incorporation of an Antioxidant.** J. F. Nelson, Elizabeth, N. J., assignor to Standard Oil Development Co., a corporation of Del.

2,462,163. **Manufacture of Vinyl and Ethylidene Esters by Reacting Acetylene with a Carboxylic Acid in the Presence of Dimethyl Aniline.** F. O. Cockerille, Albermarle Co., Va., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,462,209. **Insulating Coating Including Thermoset Polymer of an Acyl Ester of Castor Oil and an Alpha, Beta-Dicarboxylic Acid Half Ester, and, as Solvent, a Polymerizable Monomer Having the Group $H_2C{=}C$.** H. F. Miller, Pittsburgh, assignor to Westinghouse Electric Corp., East Pittsburgh, both in Pa.

2,462,252-253. **As a Glue Base for Use between Layers of Solid Material, a Resin-Forming Water-Soluble, Condensation Product Prepared from Phenol and Formaldehyde Condensed in the Presence of Alkali-Metal-Hydroxide Catalyst and Polyvinyl Alcohol or Methyl Cellulose.** R. G. Booty, Elmwood Park, Ill., assignor to Weyerhaeuser Timber Co., Tacoma, Wash.

2,462,267. **Copolymeric Organosiloxane.** J. F. Hyde, assignor to Corning Glass Works, both of Corning, N. Y.

2,462,331. **Product Including a Polymer of Ethylene Modified by a Polyhydric Alcohol Ester or a Metal Salt of Monocarboxylic Fatty Acids Having from 12 to 24 Carbon Atoms.** C. S. Myers, Westfield, N. J., assignor to Bakelite Corp., a corporation of N. J.

2,462,337. **Film-Forming Ester of a Polyhydric Alcohol and an Unsaturated Monocarboxylic Acid.** L. Shechter, East Orange, N. J., assignor to Bakelite Corp., a corporation of N. J.

2,462,345. **Monomeric Fluorine Compounds Containing a 4-Carbon Atom Ring.** P. L. Barrick, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,462,346. **Aromatic Polyfluorocyclobutane.** P. L. Barrick, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,462,347. **Reaction Products of Polyfluoroethylenes and Terminally Unsaturated Compounds.** P. L. Barrick, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,462,352. **Heat Stable Compositions Including Polymeric Vinylidene Chloride and Phenothioxine or Certain Derivatives thereof.** R. F. Biyer, L. A. Matheson, and R. C. Reinhardt, assignors to Dow Chemical Co., all of Midland, Mich.

2,462,354. **Resinous Material Obtained by Polymerizing a Monoethylenically Unsaturated, Polymerizable Organic Compound Having a Terminal Ethylenic Double-Bond, Dispersed in Aqueous Medium Containing an Oxygen-Yielding Catalyst and an Inorganic Oxidizable Sulfoxy Compound.** M. M. Brubaker, Delaware Co., and R. A. Jacobson, Landenburg, both in Pa., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,462,359. **Hydrofluorination of Unconjugated, Unsaturated Aliphatic Compounds in the Presence of Fluosulfonic Acid.** J. D. Calfee, Manhasset, and F. H. Bratton, Floral Park, both in N. Y., assignors to Allied Chemical & Dye Corp., a corporation of N. Y.

2,462,390. **Stable Aqueous Dispersions of Polyethylene Obtained by Polymerizing Ethylene in Intimate Contact with a Buffered Aqueous Solution of an Alkali Persulfate.** J. Harmon, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,462,400. **Copolymer Containing 20 to 50% of Dihydrodicyclopentadienyl Methacrylate and 80 to 50% of an Ester of Methacrylic Acid with a Saturated Aliphatic Monohydric Alcohol Having from 8 to 18 Carbon Atoms.** F. W. Hoover, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,462,412. **Light Stable Composition Including Polymeric Vinylidene Chloride and a Tetrabromoethane.** L. A. Matheson and R. F. Boyer, assignors to Dow Chemical Co., all of Midland, Mich.

2,462,422. **Polymerizing a Vinyl Halide in an Aqueous Dispersion in the Presence of a Dissolved Salt of Perdisulfuric Acid and Sodium Bisulfite.** L. Plambeck, Jr., assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,462,430. **Sulfur-Containing Polyamides Obtained by Reacting N-Methylol Polycarbonamides or N-Alkoxymethyl Polycarbonamides with a Thiol in the Presence of an Acid Catalyst.** A. K. Schneider, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,462,555. **Resinous Composition Produced by Copolymerization of Styrene and an Amount of 4,4'-Divinylbiphenyl Equal to from 1% to 5% by Weight of the Styrene.** F. Rosenthal, Cescent Park, Bellmar, N. J., assignor to Radio Corp. of America, a corporation of Del.

2,462,564. **Separation of Polymers, Including Chain-Like Molecules of Varying Molecular Weight into Fractions of Different Average Molecular Weights.** J. R. Skeen, assignor to Sun Oil Co., Philadelphia, Pa.

2,462,572. **Vulcanizing Polymers of Butadiene-1,3 and Methyl Substitution Products thereof and Copolymers of These with Aryl Olefins and Acrylonitriles, Which Includes Adding a Dixanthic Disulfide Vulcanizing Agent.** M. C. Throdahl, Nitro, W. Va., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,462,591. **Improving the Creaming of Synthetic Latices Obtained with an Ammonium Soap Emulsifier by Adding Formaldehyde to the Latex to React with the Emulsifier to Make the Latex Unstable and Increase Its Particle Size, and Then Adding an Alkali to the Latex to Render It Stable.** E. Arundale, Westfield, N. J., assignor to Standard Oil Development Co., a corporation of Del.

2,462,602. **Preparing a Mixed Vinyl Lower Alkyl Ether by Admixing the Corresponding 1-Chloroethyl Lower Alkyl Ether with Pyridine and Heating the Mixture.** D. G. Botteron, Syracuse, N. Y., assignor to Pittsburgh Plate Glass Co., Allegheny Co., Pa.

2,462,608-609. **Non-Yellowing Coumarone-Indene Resin Composition Stabilized with an Alkyl Polyhydroxy Spiro Indane.** S. G. Burroughs, Pittsburgh, assignor to Pennsylvania Industrial Chemical Corp., Clairton, both in Pa.

2,462,618. **Water-Emulsifiable, Air-Drying Coating Composition Obtained by Breaking by Hydrolyzation the Anhydride Linkage of the Addendum Reaction Product of Maleic Anhydride and a Modified Alkyd Resin, and Neutralizing the Hydrolyzed Product.** G. E. Eilerman, Milwaukee, Wis., assignor to Pittsburgh Plate Glass Co., Allegheny Co. Pa.

2,462,629. **Sunlight Resistant Composition, Including a Butadiene-Acrylonitrile Copolymer and Ethyl Cellulose, together with Plasticizers, Fillers, Sulfur, and Accelerator.** P. T. Gidley, Fairhaven, Mass., assignor, by mesne assignments, to Standard Oil Development Co., a corporation of Del.

2,462,635. **Cyclic Polymeric Organoaminosilanes.** C. P. Haber, Schenectady, N. Y., assignor to General Electric Co., a corporation of N. Y.

2,462,640. **Preparation of Methyl Siloxanes, Which Includes Hydrolyzing a Mixture of Methyltriethoxysilane and Trimethylethoxysilane.** J. F. Hyde, assignor to Corning Glass Works, both of Corning, N. Y.

2,462,658. **Plasticized Resin Composition, Including a Formaldehyde Amine Condensation Product and a Polyester of Dihydroxy Alcohol and a Dicarboxylic Acid Containing 6 to 19 Carbon Atoms.** E. W. Moffett, Milwaukee, Wis., assignor to Pittsburgh Plate Glass Co., Allegheny County, Pa.

2,462,674. **In Processing Butyl Rubber, the Steps of Milling into the Rubber a Portion of a Cyclic Carbon Ring Peroxide Having from 10 to 14 Carbon Atoms per Molecule and at Least Two Coupled Oxygen Atoms in the Molecule, and thereafter Continuing the Milling.** J. Rehner, Jr., Westfield, and P. J. Flory, Cranford, both in N. J., assignors to Standard Oil Development Co., a corporation of Del.

2,462,678. **Polymerizing Olefins in the Presence of an Oxime as Catalyst.** M. J. Roedel, Talleyville, assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, both in Del.

2,462,680. **Preparation of Carbon Dioxide-Modified Polymers of Ethylene.** D. E. Sargent, Easton, Pa., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,462,684. **Indene and Alkyl Indene Resins Stabilized with the Reaction Product of Acetone with an Aryl Amine.** F. J. Soday, Baton Rouge, La., assignor to United Gas Improvement Co., a corporation of Pa.

2,462,736. **Preparation of N,N Dimethylethanolamine.** W. F. Gresham, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,462,737. **Liquid Polymeric Condensation Product of 1,3-Diosolane and a Benzene or Alkyl Benzene.** W. F. Gresham, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,462,817. **Resin Which Is a Copolymer of 10 to 50 Parts of Tetra-Allyl Pentaerythritol and 90 to 50 parts of Methyl Methacrylate.** L. T. Smith, Philadelphia, Pa., assignor to the United States of America, as represented by the Secretary of Agriculture.

Dominion of Canada

454,292. **As a New Composition of Matter, a Polyvinyl Cyanoethyl Ether.** R. C. Houtz-Snyder, N. Y., U.S.A., assignor to Canadian Industries, Ltd., Montreal, P. Q., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., U.S.A.

454,293. **Treating Vinyl Chloride-Containing Polymers Subject to Thermal Decomposition by Admixing an N-Chlorohydantoin.** C. G. Kamin, Niagara Falls, N. Y., U.S.A., assignor to Canadian Industries, Ltd., Montreal, P.Q., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., U.S.A.

454,321. **Hard, Infusible, Insoluble Polymer of a Mixed Ester of a Polymeric Acrylic Acid, a Saturated Aliphatic Monohydric Alcohol, and Allyl Alcohol.** M. A. Pollack, Austin, Tex., and A. G. Chenicek, Barberton, O., assignors to Pittsburgh Plate Glass Co., Pittsburgh, Pa., all in the U.S.A.

454,328. **Producing a Laminated Article Having a Thick Outer Layer of Resin, Which Includes Polymerizing *in Situ* Solid and Liquid Monomeric and Polymeric Diallyl Phthalate on the Outer Surface of and in the Assembly.** T. W. Evans and E. C. Shokal, Oakland, assignors to Shell Development Co., San Francisco, both in Calif., U.S.A.

454,390. **Rubber Hydrochloride Composition Containing a C-Alkyl Substituted Piperazine.** J. P. Chittum and G. E. Hulse, Jr., both of Passaic, N. J., U.S.A., assignors to Dominion Rubber Co., Ltd., Montreal, P.Q.

454,416. **Dienes.** M. de Simo, Piedmont, and R. M. Roberts, Berkeley, assignors to Shell Development Co., San Francisco, all in Calif., U.S.A.

454,433. **One-Step Method of Producing Trichloropropionic Acid.** J. G. Lichty, Stow, assignor to Wingfoot Corp., Akron, both in O., U.S.A.

454,434. **Producing a Propiolyl Halide by Pyrolizing a Dihalo Propionyl Halide at a Temperature of at Least 170° C.** F. C. Schaefer, Cambridge, Mass., assignor to Wingfoot Corp., Akron, O., both in the U.S.A.

454,435. **Preparing Dichlorosuccinic Anhydride by Treating Molten Maleic Anhydride with Gaseous Chlorine at a Temperature of at Least 140° C.** A. M. Clifford and J. R. Long, Stow, assignors to Wingfoot Corp., Akron, both in O., U.S.A.

454,436. **Preparing Electrically Conductive Natural and Synthetic Rubber by Mixing Hydrocarbon Solvent and Conductive Carbon Black with a Mixture of a Rubber Gum Stock, Vulcanizing Agents, and Solvent.** F. A. Koehler, Hudson, assignor to Wingfoot Corp., Akron, both in O., U.S.A.

454,479. **Molding Powder Including Thermosetting Polymeric Organo-Silicon Oxide.** R. R. McGregor, Verona, and E. L. Warrick, Pittsburgh, both in Pa., assignors to Corning Glass Works, Corning, N. Y., both in the U.S.A.

454,485. **Elastic Rubber Substitute Which Is the Heat Conversion Product of a Composition Including a Partially Hydrolized Polyvinyl Acetate, Lead Chromate, and Tetrachlorquinone.** C. F. Brown, Middlebury, Conn., U.S.A., assignor to Dominion Rubber Co., Ltd., Montreal, P.Q.

454,527. **Separation of Butadiene from Butylenes.** R. C. Morris, Berkeley, and T. W. Evans, Oakland, assignors to Shell Development Co., San Francisco, all in Calif., U.S.A.

454,598. **Clear, Colorless Insoluble Resin Which Is a Copolymer of Diallyl Phthalate and Diethyl Fumarate.** E. L. Kropa, Old Greenwich, Conn., assignor to American Cyanamid Co., New York, N. Y., both in the U.S.A.

454,599. **Aqueous Emulsion of a Mixture Including a Polymerizable Vinyl Hydrocarbon and an Unsaturated Alkyd Resin Containing a Plurality of Polymerizably Reactive Alpha, Beta-Enal Groups.** E. L. Kropa, Old Greenwich, Conn., assignor to American Cyanamid Co., New York, N. Y., both in the U.S.A.

454,600. **Surface Curing of Amine Modified Alkyd Resin Film by Treatment with a Solution Containing a Heavy Metal Salt.** W. C. Norris, Cos Cob, and F. R. Spencer, Stamford, both in Conn., assignors to American Cyanamid Co., New York, N. Y., both in the U.S.A.

454,601. **Dehydrogenation Catalyst for Use in Dehydrogenating Terpenes.** J. K. Dixon, Riverside, and D. J. Salley, Stamford, both in Conn., assignors to American Cyanamid Co., New York, N. Y., both in the U.S.A.

United Kingdom

615,209. **Molding Compositions.** Imperial Chemical Industries, Ltd., and G. P. Lee.

615,229. **Synthetic Rubber.** Phillips Petroleum Co.

615,240. **Phenolic-Alkyd Resins.** Norton Grinding Wheel Co., Ltd.

615,241. **Resin Compositions and Adhesives.** Firestone Tire & Rubber Co.

615,256. **Polyvinyl Chloride Compositions.** Imperial Chemical Industries, Ltd., A. Duerden, and C. P. Herd.

615,332. **Plasticized Resins.** Bakelite, Ltd.

615,335. **Phenolic Resins.** Bakelite, Ltd.

615,363. **Polymeric Nitrogen - Containing Compounds.** Imperial Chemical Industries, Ltd., G. D. Buckley, and N. H. Ray.

615,370. **Polypentaerythritols.** Imperial Chemical Industries, Ltd., S. F. Marrian, and A. McLean.

615,385. **Bleaching Materials Made of or Containing Polyvinyl Derivatives.** Soc. Rhodiaceta.

615,395. **Factices.** Anchor Chemical Co., Ltd., and K. C. Roberts.

615,398. **Polymers.** J. Downing.

615,429. **Polymerization of Unsaturated Compounds.** Gevaert Photo-Producten N. V.

615,488. **Novolak Resins.** Bakelite, Ltd., E. G. K. Pritchett, and G. Barnett.

615,520. **Polymeric Materials.** E. I. du Pont de Nemours & Co., Inc. and J. F. Izzard.

615,688. **Color Characteristics of Polymers.** E. I. du Pont de Nemours & Co., Inc.

615,723. **Resin Emulsions.** J. J. V. Armstrong (Shawinigan Chemicals, Ltd.).

615,778. **Polyvinyl Derivatives.** Imperial Chemical Industries, Ltd., R. R. Lyne, and A. W. S. Clark.

615,835. **Coloration of Polyvinyl Plastics.** Geigy Co., Ltd., H. Jones, and C. Musgrave.

615,865. **Regenerating Vulcanized Copolymers.** Wingfoot Corp.

615,866. **Coagulation of Natural Rubber Latex.** Wingfoot Corp.

615,884. **Linear Nitrogen-Containing Polymers.** H. Dreyfus.

615,954. **Polyamides.** Imperial Chemical Industries, Ltd., and E. Ellery.

615,984. **Curing Hydrocarbon Copolymers.** J. C. Arnold (Standard Oil Development Co.)

616,026. **Adhesive Compositions.** B. B. Chemical Co., Ltd., L. E. Puddefoot, and A. M. Hall.

616,044. **Interpolymers of Aromatic Vinyl Hydrocarbons and Oils.** L. Berger & Sons, Ltd., W. T. C. Hammond, and L. E. Wakeford.

616,069. **Active Fillers for Natural or Synthetic Rubbers.** Cie. Industrielle de Credit Soc. A. R. L.

616,073. **Vinylfluorenes.** British Thomson-Houston Co., Ltd.

616,134. **Polymers and Copolymers of 2-Vinylfluorene.** British Thomson-Houston Co., Ltd.

616,174. **Plasticized Rubber from Latex.** Soc. Meridionale du Caoutchouc Someca.

616,197. **Vinyl Ethers.** Distillers Co., Ltd., E. J. Gasson, and F. E. Salt.

616,215. **Sulfurized Oils and Factice.** Anchor Chemical Co., Ltd., and K. C. Roberts.

616,260. **Catalysts for Polymerization and Condensation of Hydrocarbons.** Koppers Co., Inc.

616,282. **Stabilized Films, Including Vinyl Resins.** Firestone Tire & Rubber Co.

616,291. **Artificial Resinous Material.** Pittsburgh Plate Glass Co.

616,315. **Cellular Products from Plastic Material.** L. Berger & Sons Ltd. (Sherwin-Williams Co.).

616,320. **Tetra-Allyl Silane and Polymers thereof.** British Thomson-Houston Co., Ltd.

616,337. **Synthetic Resins.** T. Urbanski and H. J. Poole.

616,413. **Polyamides.** S. J. Allen, J. G. N. Drewitt, and F. Bryans.

616,453. **Nitropolystyrene.** Imperial Chemical Industries, Ltd., H. Zenftman, and A. McLean.

616,463. **Urea Formaldehyde Lacquer Compositions.** British Resin Products, Ltd., E. M. Evans, R. W. H. Wicking, and J. J. Wilson.

616,488. **Film-Forming Blends of Polymeric Materials.** E. I. du Pont de Nemours & Co., Inc.

616,530. **Cement or Adhesive Compositions.** Shell Development Co.

MACHINERY

United States

2,460,460. **Machine for Heat Sealing Thermoplastic Sheets.** N. Langer, New York, N. Y.

2,460,468. **Machine to Mold Plastics or Other Moldable Material.** W. S. Renier, assignor to Giddings & Lewis Machine Tool Co., both of Fond du Lac, Wis.

2,460,602. **Film Distillation Apparatus.** W. L. Semon, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,460,831. **Apparatus for Injection Molding a Thermosetting Material.** G. J Kovacs, Walled Lake, Mich.

2,460,822. **Device to Resole Rubber Boots, Etc.** J. W. La Follette, Denver, Colo.

2,460,835. **Electrical Insulation Tester.** S. G. Lutz, Washington, D. C.

2,460,845. **Form for Building Hollow Articles.** D. G. Rempel, Akron, assignor to Sun Rubber Co., Barberton, both in O.

2,460,964. **Apparatus for Molding Thermosetting Resinous Material.** F. M. Adair, Berwyn, A. J. Brunner, Congress Park, and B. M. A. Trebes, Berwyn, both in Ill., assignors to Western Electric Co., Inc., New York, N. Y.

2,461,270. **Balloon Mold.** E. E. Habib, Arlington, and D. G. Greenlie, Wayland, assignors to Dewey & Almy Chemical Co., North Cambridge, all in Mass.

2,461,600. **Molding Apparatus.** A. N. Gray, Joppa, Md., assignor to Western Electric Co., Inc., New York, N. Y.

2,461,630. **Extruder for Tubes of Plastic Material.** G. Cozzo, assignor to Hydropress, Inc., both of New York, N. Y.

2,461,856. **Die Mount for Plastic Extruders.** H. T. Tornberg, Ridgewood, assignor to Modern Machinery, Co., Lodi, both in N. J.

2,462,043. **Apparatus for Feeding Elastic Strands to a Strand Covering Machine.** O. F. Neidel, assignor to George C. Moore Co., both of Westerly, R. I.

2,462,308. **Injection Molding Machine.** R. W. Dinzl, Westfield, assignor to Watson-Stillman Co., Roselle, both in N. J.

2,462,318. **Device to Stretch Elastic Covers.** V. H. Hasselquist, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,462,474. **Coating Apparatus for Wires, Filaments, Etc.** J. K. Delano, Rye, N. Y.

Dominion of Canada

454,269. **Machine for Making Rubber-Soled Footwear.** G. M. Capdevila, Barcelona, Spain.

454,344. **Apparatus to Form Tubes of Thin Thermoplastic Resin.** W. H. Parmelee, Library, Pa., assignor to Wheeling Stamping Co., Wheeling, W. Va., both in the U.S.A.

454,437. **Device to Subdivide Segments of Rubber Stock.** E. D. George, assignor to Wingfoot Corp., both of Akron, O., U.S.A.

454,492. **Tire Repair Vulcanizer.** H. T. Kraft, assignor to General Tire & Rubber Co., both of Akron, O., U.S.A.

454,541-542. **Fusible Filament-Forming Materials Extruder.** R. W. Moncrieff and W. Pool, Spondon, England, assignors to C. Dreyfus, New York, N. Y., U.S.A.

454,565. **Plastic Extruder.** G. A. Lyon, Allenhurst, N. J., U.S.A.

United Kingdom

613,887. **Wire Splicer.** United States Rubber Co.

614,162. **Apparatus to Build Tires.** General Tire & Rubber Co.

614,244. **Extruder for Articles of Thermoplastic Materials.** S. P. A. Lavorazione Materie Plastiche.

614,269. **Apparatus to Roll a Continuous Sheet of Plastic Material with Longitudinal Bead Superimposed thereon.** I. L. Lesavoy.

614,446. **Apparatus for Kneading and Manufacturing Granulated Plastic Masses.** S. P. A. Lavorazione Materie Plastiche.

614,646. **Machines for Molding or Sticking on the Soles of Footwear.** A. Coppola.

614,647. **Device to Mold Sole, Heel, and Shank on Footwear.** W. H. Doherty.

614,800. **Extruder.** B. X. Plastics, Ltd., and D. C. Nicholas.

615,099. **Cable Stripper.** Johnson & Phillips, Ltd., and W. J. Welsh.

615,202. **Machines for Pretreating Plastic Materials.** Bata Narodni Podnik.

615,526. **Extruders.** Cie. Generale d'Electricite.

616,081. **Machine for Forming Pneumatic Tire Carcasses.** E. W. Witt.

616,199. **Heading and Extrusion Dies.** British Thomson-Houston Co., Ltd.

616,508. **Apparatus for Treating Fabric.** Seiberling Rubber Co.

UNCLASSIFIED

United States

2,460,315. **Tire Pressure Alarm.** W. Torrance, Calgary, Alta., Canada.

2,460,352. **Coupling for Hose, Etc.** J. A. Jensen, Haverford, assignor to Philadelphia Valve Co., Philadelphia, both in Pa.

2,460,653. **Hose Coupling.** F. J. Raybould, Lakewood, assignor to Weatherhead Co., Cleveland, both in O.

2,460,833. **Hose Coupling.** L. A. Lamb, Cleveland Heights, O.

2,461,074. **Hose Coupling.** G. K. Mozingo, assignor of 25% to O. T. Olden and 25% to R. Logston, all of Ashtabula, O.

2,461,267. **Tire Chain Holder.** M. Givens, Montclair, assignor to P. G. Gaylor and F. Laifer, both of Newark, both in N. J.

2,461,299. **Tire Deflation Switch.** C. E. Sullivan, Atlanta, Ga.

2,461,737. **Emergency Tire Chain.** H. P. Huffman, Rockford, and R. B. Snively, Winnebago, both in Ill.

2,461,758. **Tire-Protecting Skid.** R. Moss, North Miami, Fla., assignor of one-half to R. Ferwerda, Cleveland, O.

2,461,818. **Self-Sealing Hose Coupling.** F. Hague, Devon, assignor to Sun Oil Co., Philadelphia, both in Pa.

2,462,378. **Non-Skid Tire Chain.** F. G. Fox, Doylestown, Pa.

2,462,586. **Guard Ring for Resisting Extrusion of Rubber-Like Sealing Rings into the Working Clearance of Cylinder-Piston Assemblies.** D. J. Whittingham, Watertown, N. Y., assignor to New York Air Brake Co., a corporation of N. J.

Dominion of Canada

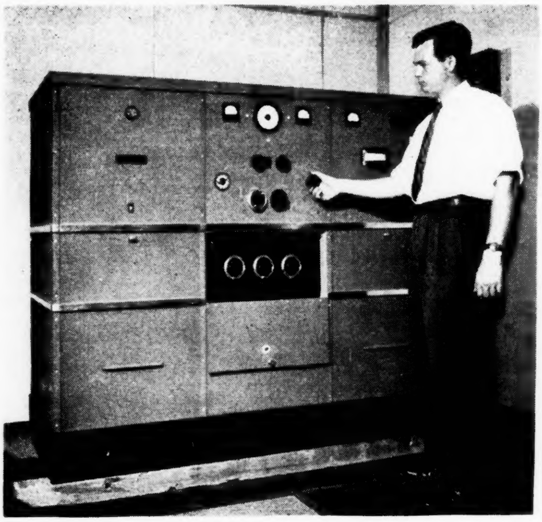
453,741. **Method of Packaging with a Heat-Stretchable and Heat-Sealable Film.** G. M. Brown, Toronto, Ont., assignor to Wingfoot Corp., Akron, O., U.S.A.

454,352. **Tire Remover.** P. Croteau and A. Cote, both of Montreal, P.Q.

454,358. **Cable Clamp.** P. S. Everley, San

(*Continued on page 140*)

New Machines and Appliances



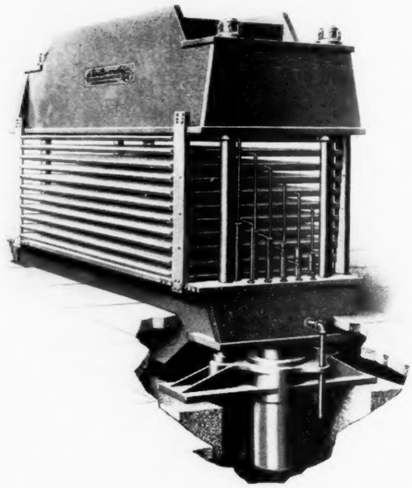
Spinco Ultracentrifuge

Improved Ultracentrifuge

THE Spinco ultracentrifuge, a research tool for the centrifugal purification and molecular weight determination of particles in the larger molecular size range, is offered by Specialized Instruments Corp., Belmont, Calif. The instrument has a unified design housed in a single enclosure and is ready for operation with the simple connection of power and cooling water. Sound insulation is not required because the unit is powered by a quiet electric drive.

The machine consists essentially of means for driving various types of rotors at adjustable constant speeds up to 70,000 r.p.m. together with associated controls and related apparatus for measurement and observation of conditions involving the sample under test. This apparatus includes an optical system of the refractive index type with viewing screen, a high-intensity mercury arc light source, a camera for permanent records, high vacuum pumping equipment for evacuating the rotor chamber, a refrigeration system for obtaining reduced rotor temperatures, and complete controls and safety interlocks. Maximum centrifugal force which can be exerted on the sample is 260,000 times gravity.

SEE PAGE 4



Hydraulic Press for Hot Laminating

A NEW lightweight hydraulic press designed especially for hot laminating has been announced by Columbia Machinery & Engineering Corp., Hamilton, O. With 10 openings and platens 60 by 80 inches in size, the press operates on a unique principle in which the base rises in operations. This feature permits lighter construction and considerable saving in cost without sacrifice of strength or other desirable qualities. The platens are two inches thick and the base and the crown are designed to insure minimum deflection under full pressure. The company's exclusive platen spacer design provides accurate spacing with maximum rigidity.

Other features of the press include cast steel cylinders; cast Meehanite rams; all-welded pipe connections; simplified trouble-free steam pressure system to the platens; a pumping unit similar to that used on the company's large hot plate presses; and an automatic opening device to open the press at the end of any predetermined time period.

Thickness Micrometer

THE new Cady Exact micrometer made by E. J. Cady & Co., Chicago Ill., is said to provide an accurate thickness measurement for steel, plastics, papers, boards, mica felt, glass, foils, aluminum, or other sheet stock up to ½-inch in thickness. The dead-weight principle employs devices to maintain uniform

(*Continued on page* 134)

EUROPE

GERMANY

Polarographic Method of Determining Free Sulfur

G. E. Proske recently explained[1] his rapid polarographic method of determining free sulfur, particularly in vulcanizates. Reviewing known methods, Dr. Proske pointed out that none of them is completely suitable; the most accurate, the gravimetric, is also the slowest; other speedier methods are either lacking in accuracy or employ highly corrosive chemicals. A method described by Burger in German scientific papers a few years ago was a considerable improvement. Here the material to be analyzed is melted in a tube with metallic potash; the sulfur is converted into sulfide which can be determined iodometrically. The whole process, said to be very accurate, takes only 20 minutes and has been successfully used on numerous organic substances. However there seems to be no evidence of its applicability to vulcanizates. Dr. Proske claims that his method takes only 90 minutes and is remarkably accurate, and he also emphasizes that the normal eight-hour extraction with acetone which must precede the actual analysis in every other method is not necessary with his process.

The fundamentals of polarography have been widely discussed in the literature; Dr. Proske notes that Heyrovsky in his book, "Polarography," even describes a method of determining sulfur in organic substances by this means, but adds this method is far inferior to his own both as regards speed and accuracy.

It is known that atmospheric oxygen contained in aqueous solutions can be determined by polarograph — it is reduced to H_2O_2 in neutral solution at approximately 0 volt, and this in turn is reduced to H_2O at -1.1 volt. Because of the chemical relation between oxygen and sulfur it was assumed that under suitable conditions the latter could also be determined in this way, since sulfide ions can be oxidized polarographically. This proved to be the case.

For a polarographic determination of sulfur a first requisite is a solvent for the sulfur that can be mixed with water or itself permits formation of ions. At first acetone was used, but the readiness with which it takes up oxygen from the air was a disadvantage, serious enough to cause it to be abandoned in favor of pyridine which not only contains less oxygen than acetone to begin with, but can readily be freed from oxygen and does not reabsorb it from the air again so easily. Another difference is that while only 0.083-gram of sulfur dissolves in 100 grams of acetone at 25° C., 1.35 grams dissolve in the same amount of pyridine at the same temperature.

To the sulfur-pyridine solution must be added an electrolyte, and Dr. Proske selected one including 12.5 grams glacial acetic acid, 27.2 grams sodium acetate, 100 cc. 2% Tylose-solution (sodium salt of cellulose oxy-acetic acid) and 500 cc. water. A mercury anode was used. After initial tests on sulfur had demonstrated the reliability of the method, it was also used to determine the free sulfur in vulcanized rubber. In this case 0.5-gram of vulcanized rubber was boiled with pyridine for 30 minutes; the extract poured off into a measuring flask; the vulcanizate again boiled for 30 minutes with fresh pyridine, and the extract added to the first. Depending upon the amount of sulfur, two to 10 cc. of the solution is polarographed; the amount of liquid to be used is brought up to 10 cc. by filling up with fresh pyridine, while 3 cc. of the previously mentioned electrolyte is also added.

Very satisfactory results are claimed, also with Buna vulcanized with 10% sulfur. It is emphasized, however, that the mixture to be analyzed may contain ingredients, accelerators for instance, capable of affecting the outcome. Mercaptobenzthiazole does not seem to have an undesirable influence on results.

[1] *Kautschuk u. Gummi*, 1, 12, 339 (1948).

Postwar Rubber Statistics for Bizonia

The Bureau of Statistics of the Joint Economic Administration has published the first postwar foreign trade statistics for the Bizonal area. The data are not quite complete since interzonal trade is not covered so that shipments, usually small, to foreign countries via the French or Soviet Zone are not included.

The figures show imports of natural rubber, latex, and syn-

thetic rubber total 19,414.3 metric tons, valued at 30,489,000 marks, for the first half of 1948. Imports in June of that year alone came to 3,216.3 metric tons; for the same period imports of waste rubber, balata, gutta percha, and the like amounted to 9,753.3 metric tons, value 1,465,000 marks. The bulk of the raw rubber came from Malaya; while more than half of the waste rubber came from Britain and the rest from the United States.

Imports of rubber manufactures were small and were chiefly supplied by Britain and the United States.

Exports of rubber goods included 10,000 kilograms of rubber solution and cement; 5,460 kilograms, cycle tubes; 29,200 kilograms, tubing and hose; 23,100 kilograms, belting; 11,900 kilograms, shoes; 330,000 kilograms, automobile tire treads; 88,700 kilograms, bicycle tire treads; 91,900 kilograms, miscellaneous goods including floor coverings, rubber and fabric sheet, and rubber-covered iron rolls; 2,400 kilograms, rubber bathing caps; 24,800 kilograms, elastic fabric; 122,700 kilograms, hard rubber goods. The articles went chiefly to Belgium, the Netherlands, Finland, Switzerland, and Scandinavia. Early in the year Czechoslovakia was also frequently mentioned both as importer and exporter of rubber goods to Germany.

New Rubber Organization

The existing individual rubber organizations of the rubber industry in the United States and British zones have united in an Industrial Association of the German Rubber Industry at a meeting November 5, 1948, at Frankfurt a.M. Included in the new association are the Society of the Bavarian Rubber Industry, the Association of the German Rubber Industries in Hesses, the Association of the German Rubber Industry in Wurttemburg-Baden, and the Economic Union of the German Rubber Industries in the British Zone. The societies of the French Zone are free to join the new organization; those in Berlin do not belong to it, but representatives of those in the Western Sector of Berlin were present at the founders' meeting.

The board of directors of the new organization, whose headquarters are to be in Frankfurt a.M., consists of four members: Directors Friedrich of the Phoenix Co., Hamburg; Dr. Ziegler, of the Metzler concern, Munich; Fellinger, of the Continental company in Hannover; and Bruggemann, of Hessische Gummiwaren-Fabrik Fritz Peter, Kl.-Auheim a.M. About 99% of the West German rubber industry is represented by the new association, which counts 165 member firms, employing about 42,000 persons.

Production of Tires in Bizonia

Tire production in the Bizonal Area of Germany continued to increase in the first half of 1948; 665,000 tires for automobiles and trucks came out of local factories in that period, as compared with 395,000 in the first half of 1947 and 510,000 in the second half of that year. Output in 1947 totaled 905,000 tires, against 848,000 in 1946; output of tires for motor vehicles in 1936 numbered 2,724,000.

The increase in production of cycle tires has been relatively slower, having suffered a setback in 1947, when production dropped to 3,898,000 from 3,952,000 tires in 1946. In the first half of 1948 output was up to 2,694,000 units; however, even if total production for the year comes to about 6,000,000 cycle tires, that is still a far cry from the 1936 total of 29,448,000 cycle tires.

German Rubber Industry Notes

Farbenfabriken Bayer, Leverkusen, is to receive raw material, repair equipment, and clothing and footwear for workers to facilitate the production of titanium dioxide, which has been in short supply.

The lithopone works of Sachtleben A. G., Hamburg/Niederrhein, intends to increase production from 1,600 to 2,000 tons a month.

Helmut Gunther, Dresden, collaborating closely with the German Leather Institute in Freiburg, Sa., has reportedly developed a soling material said to consist of a mixture of rubber and chemically treated peat.

The Stickstoffwerk Piesteritz, Kreis Wittenburg (Sachsen-Anhalt), is understood to be increasing the production of carbon black for the rubber industry to the extent that all the requirements of the Russian zone of occupation are expected to be covered.

A new research and experimental laboratory for natural and

synthetic rubber known as Tefola—K-G., was established some months ago by Dr. St. Reiner, Berlin-Friedrichshagen.

The Economic Administration in Bizonia has announced price reductions for various types of rubber goods. Consumer prices of soling materials and jarrings are to be 10% less; rolls for mangles 25% lower; belting 20% lower. Prices on hose will average 10% less. The reduction in prices for tires for passenger cars amounts to 4.5%; for heavy duty tires, 9%; tubes for both types of tires will be 11% cheaper.

Complying with a request by tire manufacturers, the Economic Administration has agreed to arrange for fixed selling prices for dealers so that consumers may be sure they are actually getting goods at the reduced rates.

The Dechema, German Society for Chemical Apparatus, Frankfurt a.M., has resumed activities. The society, which aims at the advancement of chemical apparatus and consumer goods technique by planned collaboration between chemists and engineers, held its first postwar meeting on May 28, 1948, in Frankfurt a.M., when several papers were read, including "Silicone, New Construction Material for Apparatus," by F. A. Henglein; "The Development and Present Application of High-Frequency Heat in the Chemical Industry," I. Franz; and "An Electro-Static Intensifier for pH Value Measurements," Th. Gast.

The Dechema Haus was destroyed in the war in 1944, and the society's offices are now at 10 Ulmenstrasse, Frankfurt a.M.

The Bizonal area has made an agreement with Czechoslovakia to supply chemical products valued at $2,909,500 in exchange for certain specified goods. German shipments will include, among others, butyl and ethyl acetate, ethylene glycol, butanol, plastics molding powders, formaldehyde, curing agents and antioxidants, organic and inorganic pigments.

GREAT BRITAIN

Tire Dealers Overstocked

At an extraordinary meeting of the National Association of Tire Specialists held recently the president, A. E. Batt, revealed that most tire dealers were overstocked, and he added that unless there was a marked increase in gas rationing, tire dealers would continue to be in the doldrums for some time to come. The position had been foreseen some months earlier, he added, and the Association had accordingly requested tire manufacturers to undertake to complete tire dealers' stock orders before supplying users direct. No tire manufacturer, however, had wished to agree, and large quantities of tires had been supplied direct.

It should be explained that tire dealers must submit stock orders in order to qualify in certain classifications under the post-control tire distribution plan.

Another problem facing tire dealers is caused by the circumstance that under the present government's distribution plan every dealer must order a certain minimum quantity of tires per annum from each of the 13 tire manufacturers and that all must be sold at the same price. Consumers, however, have their preferences, and already sales resistance is making itself felt to certain brands of tires.

In the House of Commons recently the question of the dumping of surplus tires while they were still serviceable was brought up. It was alleged by a member that thousands of perfectly good tires were among the 1,800 tons of old tires dumped by the Ministry of Supply in a pit at New Hayden, and that there were apparently well-founded rumors that the Board of Trade intended to dump another 8,000 tons of rubber in a disused pit in Staffordshire.

United Kingdom Exports in 1948

Total exports of tires in 1948 was valued at £9,911,622; inner tubes, £1,200,207; and rubber goods classed as "rubber manufactures," £6,351,370. The respective 1947 figures were £6,808,906, £944,045, and £6,309,785. Monthly figures for "rubber manufactures" exports show a reduction in value in December, 1948, as against November; the respective figures were £497,685 and £556,886.

Because of difficulties encountered in selling abroad, new export targets for the end of 1949 have had to be considerably reduced for various classes of rubber goods, excluding tires and electrical goods, the president of the Board of trade revealed. The

export target for rubber manufactures in general has been reduced from 330% of 1938 to 220%, the equivalent of a monthly rate of exports to a value of £700,000 instead of £1,050,000. Foreign trade in footwear of all kinds was disappointing in 1948; accordingly 1949 overall target for footwear has been reduced from 295% of 1938 (volume) to 183%. There is no separate target for rubber footwear. Nor is there a separate target for tires, which are grouped with vehicles. Here business has been better, and the target was raised to 263% of 1938 (volume). It is expected that tire exports will continue to increase. Electrical goods also have a slightly higher target; here the main increase is expected to come from exports of wires and cables.

British Rubber Industry Notes

A recent White Paper deals with the United Kingdom's four-year economic recovery program submitted by the government to the Organization for European Economic Cooperation last October. A statement in it regarding future rubber production in British territories has been the subject of much criticism in leading rubber circles here. This statement reads:

"Production of rubber which was 400,000 tons in 1936 is expected to rise to 830,000 tons in 1952-53. This is an important earner of dollars; in 1947, exports to the United States were valued at about $180,000,000."

Edmund Henry Gilpin, director of Baker, Perkins, Ltd., Peterborough, manufacturer of rubber and other machinery, has been knighted in recognition of his work as a member of the Export Guarantees Advisory Council of the Board of Trade.

On January 12, 1949, the first of a course of 12 weekly lectures on the physical and chemical properties of Rubber was given at the New National College of Rubber Technology, Northern Polytechnic, Holloway, London. The lectures, arranged in conjunction with the BRPRA, provided information on recent developments and were intended to meet the needs of both specialists and students desiring to keep abreast with modern views.

The council of the Research Association of British Rubber Manufacturers has selected from many applicants S. G. Loe as its new secretary and administrative officer. Mr. Loe, 38 years old, was for the last three years secretary of the British Launderers' Research Association. During the war he had wide experience on Ordnance stores control; before the war he had been connected with the oil industry.

Government control over a number of items has lately been abolished or relaxed, and among the materials affected are various chemicals of interest to rubber manufacturers, besides machinery for the textile, rubber, and plastics industries.

The British Plastics Federation and the British Standards Institute have agreed on a scheme for certification of plastics to insure that materials and articles are correctly manufactured according to British Standards Specifications.

In his Views and Reviews, in *India Rubber Journal*, P. Schidrowitz calls attention to a cold-molding thermoplastic material known as Fibrinyle, discussed in *British Plastics*.[1] It is stated that this material offers a new way to produce very large moldings very simply and without the expense of excessive tooling and handling which other methods involve. Fibrinyle is a fibrous thermoplastic material originally in the form of a dough that can be rolled into sheets and handled like wet leather. A sheet is laid over a former, lightly shaped by hand; any surplus is gathered into a fold and cut away. The open ends are welded by light pressure with a flat blade, and the surface is smoothed by light rolling with a squeegee. Natural shrinkage insures accurate fitting on the former. The goods are finished by heat treatment, for which infrared drying was found to be best.

[1] 20, 560 (1948).

FRANCE

At a meeting of the Association Française des Ingenieurs du Caoutchouc, held on June 10, 1948, P. Walter, manager of Laboratories A. R. S. I., discussed certain new machines for use in rubber laboratories. Mentioned was a combined mixer-calender and vulcanizing press mounted on a single base. The mixer-calender serves as a mixing machine when its two cylinders are horizontal; with the cylinders in a vertical position the device is a calender. The construction of the device permits instantaneous change from one position to the other. The cylin-

ders are electrically heated to a maximum of 250° C.; they have a diameter of 70 millimeters and a useful length of 200 millimeters, and are adjustable so as to be up to 12 millimeters apart. The cylinders are driven by gears, chain, and endless screw, and five revolving speeds are possible. The gears can be switched to permit equal speeds for calendering or with 30% friction for mixing.

On the same base with the mixer-calender is an electrically heated vulcanizing screw press with one platform, and four columns. The dimensions of the platen are 200 by 250 millimeters, and maximum spacing is 45 millimeters. A single galvanometer serves to indicate surface temperatures for the mixer-calender as well as for the press. The base on which these devices are mounted is one meter long by 65 centimeters wide, and the weight is about 100 kilograms. Electrical contact is made by means of an ordinary plug.

An autoclave which can be used both for polymerizing synthetic resins and curing rubber compounds is constructed of stainless steel and has a capacity of about six liters. On its cover are mounted a stuffing box to permit passage of an agitator, and also means to hold a thermocouple and a thermometer. The stuffing box is cooled by a refrigerating device which is also mounted on the auotclave and ends in another small autoclave in which condensation products are collected.

A laboratory table, 1.30 meters long, 75 centimeters wide, and 80 centimeters high, has arranged thereon nine different appliances including a small lathe; another lathe with various attachments for grinding and buffing surfaces, as well as a circular saw for wood and metal; a centrifuge; a vacuum and compressed air pump; a pebble mill; a paint mill; an agitator; and a powder mill for dry materials. All these devices are driven by a single electric motor, and each device has its individual release so that only one or all may be used at the same time.

AUSTRIA

According to recent press reports, the Semperit works, the leading rubber manufacturing concern in Austria, has now exceeded prewar production levels. But even so, it has not yet been possible to cover the increased domestic requirements for various types of goods, especially industrial rubber articles. The company therefore plans an expansion program to increase productive capacity not only to meet the greater home demand, but also to provide a substantial surplus for export.

Production of automobile tires will be raised from 500 to 1,000 daily. Rayon for tire cord for the additional tires will have to be imported as present rayon production is insufficient. Output of rubber footwear is also to be raised, despite the fact that the necessary textiles are in short supply, hampering present operations.

The firm's increased cycle tire output, exceeding prewar level, made possible the discontinuance of tire rationing as of January 1, 1949.

The absence of trade agreements with former customer countries is affecting export prospects, characterized as none too bright at present.

Editor's Book Table

BOOK REVIEWS

"Principles of High-Polymer Theory and Practice." Alois X. Schmidt and Charles A. Marlies. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. Cloth, 6 by 9 inches, 754 pages. Price $7.50.

This is an excellent and comprehensive text on the chemistry and physics of high polymers, with emphasis on fibers, plastics, rubbers, coatings, and adhesives. The presentation attempts to correlate the phenomena applying to these materials in order to provide a suitable background for further work involving high polymers. Much attention is given to structure, intermolecular forces, size and shape of molecules, rheology, and chemistry of the liquid and solid states. Although intended as a text for both undergraduate and graduate courses in high polymers, the subject matter requires a good grasp of physical chemistry, thermodynamics, mechanics, and physics and is therefore probably more suited to the graduate level of study.

Chapter headings include introductory definitions and concepts; molecular forces; some special behavior and properties of high polymers; polymer formation and modification; structures of high polymers; solubility and molecular-weight relations; rheology; molding and manipulation; mechanical properties; electrical, thermal, and optical properties; fibers and fibrous products; rubbers; surface coatings; adhesives; and resin product development—phenolic resins. Many literature references, appendices of tables and charts, and a comprehensive index round out this valuable book.

"Chemical Russian, Seltf-Taught." James W. Perry, Massachusetts Institute of Technology, Cambridge, Mass. Contributions to Chemical Education, No. 4. Published by the *Journal of Chemical Education*, Easton, Pa. 1948. Cloth, 5 by 8 inches, 228 pages.

Interest in Russia and scientific developments in that country has probably never been so acute as it is today, and many a chemist would like to be able to read about Russian technical advances in the original Russian, but is held back from attempting to learn the language by the apparent difficulty of the undertaking.

In "Chemical Russian, Self-Taught," J. W. Berry sets himself the task of encouraging beginners and putting them on the right path of acquiring foreign languages. Having taught himself several foreign languages, he is well qualified for the task and in the first section of the book begins by exploding the myth of the necessity of a "mysterious aptitude." In his view the key to proficiency in a foreign language is a willingness to develop ability to think in a way that is at times different from the thought habits acquired during years of speaking English. Dictionary and grammar are essential aids in learning a language, but it is necessary to know how to use them, and the author gives suggestions for study methods, in the second section. In the next four sections he treats of the vocabulary problem, inorganic nomenclature (with particular attention to troublesome peculiarities), organic chemical nomenclature, and grammar, respectively. A glossary of technical terms completes the book.

Mr. Berry gives some excellent advice and supplies a large number of examples to make his points, but this reader would have preferred shorter word lists, in some cases, so as to make place for sample sentences to illustrate the workings of that special difficulty of the Russian language, the verb aspects; also larger Russian print. Beginners will find it a strain on their eyes to try to distinguish the different characters of the odd-looking alphabet in the type that has been employed.

"Instrumental Methods of Analysis." Hobart H. Willard, Lynne L. Merritt, Jr., and John A. Dean. D. Van Nostrand Co., Inc., 250 Fourth Ave., New York 3, N. Y. Paper, 8½ by 11 inches, 250 pages. Price $4.

A review of the theoretical and practical aspects of instrumental methods of analysis, this book is an outgrowth of courses given at the University of Michigan and Indiana University. Intended for use as a college text, the book combines detailed explanations of the principles of each method described together with full laboratory directions for each operation. In addition to its value as a textbook, the volume provides the industrial chemist with a basic knowledge of instrumental methods of analysis together with bibliography references covering more advanced work.

Individual chapters are devoted to each type of analysis, as

follows: visual colorimeters; photoelectric colorimeters and fluorescence meters; turbidimeters and nephelometers; spectrophotometry and flame photometry; spectrography; X-ray diffraction methods; radioactivity; the refractometer and interferometer; thermal conductivity and other methods of gas analysis; mass spectrometry; the centrifuge; pH determination; potentiometric titration; conductometric titration; electrolytic separation of metals; polarography; and amperometric titration. Reference tables and a subject index are appended.

NEW PUBLICATIONS

"Farrel Speed Reducers." Bulletin 449. Farrel-Birmingham Co., Inc., 344 Vulcan St., Buffalo 7, N. Y. 40 pages. This bulletin presents information on the selection, operation, and maintenance of speed reducing units. Complete descriptions are given of the Farrel speed reducers, including specifications, ratings, load capacities, dimensions, and weights.

"Services on Retainer." Foster D. Snell, Inc., 29 W. 15th St., New York 11, N. Y. 8 pages. This bulletin describes the company's three types of services on retainer, including scope and cost of each type. Descriptions of the company organization and a list of other publications are also given.

"Neoprene Type RT." Report No. 49-2, February, 1949. L. R. Mayo. E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. 10 pages. Information is given on Neoprene Type RT, a new polymer whose vulcanizates have properties similar to those of Type GN and GN-A stocks, but possess superior resistance to hardening owing to elastomer crystallization.

"Elastomer Cements Containing MDI-50." BL-230, February 25, 1949. 8 pages. Additional information on MDI-50 cements is given including solvent systems and their effects on cement stability and adhesion; effect of MDI-50 concentration on cement stability and adhesion; and effect of cement storage on adhesion.

"Specifications for Government Synthetic Rubbers." Revised Edition, effective January 1, 1949. Office of Rubber Reserve, Reconstruction Finance Corp., 811 Vermont Ave., Washington 25, D. C. 111 pages. This revised edition is in looseleaf form to permit ready incorporation of future revisions. Changes since the last edition of January 1, 1947, include: addition of specification limits for many new GR-S and GR-I polymers; deletion of information on GR-M polymers; inclusion of a test method for determining shrinkage of solid polymers; inclusion of test methods for determining coagulum and filterability of latices; and expanded descriptions of sampling and testing procedures.

"The Handling of Webs and Monofilaments." C. A. Litzler. Industrial Ovens, Inc., Cleveland 11, O. 20 pages. A reprint of a paper originally presented before the American Society of Tool Engineers, this report covers primary considerations in handling operations involving flexible and continuous strand or web materials, such as wire, monofilaments, cords, tapes, tubings, paper, textiles, and films.

"Building 204." General Aniline & Film Corp., New York, N. Y. 20 pages. This bulletin illustrates and describes the company's new plant for producing derivatives of acetylene under high pressure and temperature. The process is described together with its products and their applications.

Communications of the Indonesian Rubber Research Institute, Buitenzorg, Java. **"Application of Cinchona Alkaloids in the Rubber Industry."** R. F. A. Altman and G. J. van der Bie. No. 56. 24 pages. Certain cinchona alkaloids are shown to be of interest as rubber accelerators and antioxidants. This report was reprinted in *Industrial and Engineering Chemistry*.[1]

"The Determination of Nitrogen in Crude Rubber." G. J. van der Bie. No. 64. 8 pages. A standard procedure is established for use of various modifications of Kjeldahl's method for determining nitrogen content, and use of a selenium catalyst is shown to be preferable. The Ter Meulen hydrogenation method for determining nitrogen content is shown to give comparable results.

[1] 40, 897 (1948).

"Research Keeps B. F. Goodrich First in Rubber." B. F. Goodrich Co., Akron, O. 16 pages. This booklet illustrates and describes activities at the new Goodrich research center at Brecksville, O.

Bulletins of New York Belting & Packing Co., Passaic, N. J. **"Conveyer and Elevator Belting."** 24 pages. **"Transmission Belting."** 16 pages. These bulletins describe and illustrate the company's lines of conveyer and elevator and transmission belting, respectively, and give engineering characteristics and information on applications.

Publications of The British Rubber Producers' Research Association, 48 Tewin Rd., Welwyn Garden City, Herts., England. No. 101. **"Large Elastic Deformations of Isotropic Materials. Part IV.** Further Developments of the General Theory." R. S. Rivlin. 24 pages. The equations of motion, boundary conditions, and stress-strain relations for a highly elastic material, expressed in terms of the stored-energy function, are now transformed into forms more suitable for evaluating the forces needed to produce a specific deformation.

No. 102. **"Flow Phenomena in Rubber.** I. Flow Curves for Natural Rubber." L. R. G. Treloar and D. W. Saunders. 16 pages. By using a modified form of Mooney viscometer, the relation between rate of flow and applied shear stress in natural rubber is examined experimentally over the 50 to 140° C. temperature range. The temperature coefficient of flow rate is consistent with the Eyring theory which holds that flow takes place by the movement of relatively short segments of molecular chains.

No. 103. **"The Coupling Reaction of Cinnamyl Halides.** Meso-Alpha,Beta-Divinyldibenzyl and the Phenylvinylmethyl Radical." H. P. Koch. **"Molecular Configuration and Isomorphism in the Meso-Alpha,Beta-Divinyldibenzyl Series."** G. A. Jeffrey, H. P. Koch, S. C. Nyburg. **"Absorption Spectra of Dicinnamyl and Some Related Compounds."** H. P. Koch. 18 pages. X-ray analysis revealed the existence of unusually short single bonds separating the double bonds in 1:5-spaced unsaturated system. The third paper shows that this anomaly cannot be ascribed to a novel kind of conjugation of double bonds across three single bonds. The course of preparation of the 1:5-unsaturated hydrocarbon dicinnamyl used in the investigation is described in the first paper, and the properties of a new hydrocarbon, meso-alpha,beta-divinyldibenzyl, are described in the first and second papers.

"Fifteen Years of Successful Service." Chemical Specialties Research Laboratories, New York, N. Y. 8 pages. This booklet describes the company's four forms of service: (1) monthly reports of subscribers; (2) past reports to subscribers; (3) past reports to non-subscribers; and (4) manufacturing formulae.

"Dynamic Research." General Cable Corp., New York, N. Y. 50 pages. The scope of research work being done in the company's laboratories is described and illustrated in this handsome booklet. A tabulation of the company's accomplishments through the years is also included.

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Thickness Micrometer

(Continued from page 124)

measuring pressure at all times and at any point of anvil travel, regardless of the thickness of the article being measured. The anvil is lifted by the top lever and descends by gravity, with a dash-pot action preventing too rapid descent. The pressure per square inch of the instrument meets both A.S.T.M. and T.A.P.P.I. standards.

The instrument is provided with zero adjusting devices which permit the indicator to be set at exact zero on the dial. Internally, the mechanism is designed to prevent an accidental change of this zero adjustment and to maintain perfect alinement of working parts. The dial is six inches in diameter, clearly marked in either thousandths or half-thousandths of an inch graduations, glass covered, and located for convenient and accurate reading. The sturdy construction of the one-piece cast frame and bar permits use by unskilled operators.

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

Effective July 1, 1947

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
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Allow nine words for keyed address.	**Address All Replies to New York Office at 386 Fourth Avenue, New York 16, N. Y.**	*Letter replies forwarded without charge, but no packages or samples.*

SITUATIONS WANTED

CHEMICAL ENGINEER: NINE YEARS' COMPOUNDING EXperience, laboratory-plant operations. Drug sundries, high precision aeronautical-automotive specification molded products, analytical-physical testing, color work, rubber-metal adhesions. Desires technical sales. Age 32, married. Enthusiastic, energetic, personable, honest and excellent recommendations. Address Box No. 327, care of INDIA RUBBER WORLD.

TECHNICAL SALES—YOUNG, PROGRESSIVE, AND ALERT individual now employed as Director of Research and Development, seeks technical sales position with company manufacturing or merchandising compounding ingredients and chemicals for the rubber and plastic industries. Twelve years' experience at home and abroad in research, development, compounding, factory processing, and production. Age 31. Graduate. Address Box No. 328, care of INDIA RUBBER WORLD.

SITUATIONS OPEN

GRINDING WHEEL RESINS. RELIABLE MANUFACTURER will make salary or commission arrangement if preferred on a permanent basis with Resin man experienced in selling to the Grinding Wheel Trade. Our present representatives have been notified about this advertisement. Address Box No. 324, care of INDIA RUBBER WORLD.

CAPABLE ENGINEER—FOR SETTING UP A FABRIC COATING Plant in Tel Aviv, Israel. Position can be temporary or permanent if desired. The man applying for this job should have extensive experience in fabric coating or related textile, paper, or rubber machinery. Address Box No. 325, care of INDIA RUBBER WORLD.

RUBBER CHEMIST—MUST BE FULLY VERSED IN THE PROBlems of compounding natural and synthetic rubber, for plant in western Pennsylvania making a specialty of made-to-order molded goods, wrapped goods and roll coverings, and factory control of stocks through production. State full qualifications, references, wages required, etc., in your reply. Address Box No. 326, care of INDIA RUBBER WORLD.

COATING PLANT SUPERINTENDENT FOR NEW ENGLAND location. Must have at least ten years' experience with thorough college background. State full qualifications in first letter. This ad is known to our employes. Address Box No. 340, care of INDIA RUBBER WORLD.

SITUATIONS OPEN (Continued)

RUBBER CHEMIST—MUST HAVE EXPERIENCE COMPOUNDing Buna N, neoprene, and natural rubber for molded and wrapped mechanical rubber goods, capable of duplicating compounds of molded parts submitted. Well-established company in Texas making oil-field equipment: prefer one with factory experience. State age, experience, and salary expected. All replies kept confidential. Address Box No. 335, care of INDIA RUBBER WORLD.

TIRE COMPOUNDER

Excellent opportunity with progressive organization for man with eight to twelve years' experience in tire compounding. Location Midwest. State age, experience, and salary desired. Replies strictly confidential. Address Box No. 336, care of INDIA RUBBER WORKS.

WANTED—A WELL-ESTABLISHED RUBBER MANUFACTURER doing custom and stock molding desires representatives in the following territories: New York, Upstate New York, and Philadelphia. Exceptional opportunity. State qualifications, experience, and references. A personal interview will be arranged. Address Box No. 337, care of INDIA RUBBER WORLD.

MANAGER, PROVEN EXECUTIVE, EXPERIENCED IN SALES, compounding and manufacturing of mechanical goods, solid and semi-pneumatic industrial tires and extruded products. Must have record for getting results. Excellent opportunity. Write Box No. 338, care of INDIA RUBBER WORLD, giving full information and minimum salary to start. Enclose photograph.

WANTED: RUBBER COMPOUNDER

Chemical engineer with approximately 10 years' of practical experience in compounding of naural and synthetic rubber. Experience in manufacturing of rubber mechanical goods desired. Large company located in sout western Ohio. Write giving details of experience and salary. Address Box No. 339, care of INDIA RUBBER WORLD.

LATEX CHEMIST

Several years' experience in compounding of natural and synthetic latex for use in dipping, impregnation, and lamination. Desire aggressive individual to initiate and carry through development of new compounds. Please give details of experience, education, and salary requirements. Location in New York area. Address Box No. 344, care of INDIA RUBBER WORLD.

(Classified Advertisements Continued on Page 137)

Market Reviews

CRUDE RUBBER

Commodity Exchange

WEEK-END CLOSING PRICES

	Jan. 29	Feb. 26	Mar. 5	Mar. 12	Mar. 19	Mar. 26
No. 1 Contract						
May	18.95	18.30	18.75	18.94	19.53	18.70
July	18.65	18.10	18.52	18.70	19.30	18.50
Sept.	18.45	17.98	18.40	18.54	19.10	18.53
Nov.	18.32	17.88	18.30	18.41	18.95	18.18
1950						
Jan.	18.20	17.78	18.20	18.30	18.80	18.05
Mar.	18.10	17.68	18.10	18.20	18.70	17.95
Weekly Sales, Tons:						
No. 1 Contract	1,900	2,730	3,840	1,910	4,600	1,700
Std. Contract	420	20	220	20	0	0
Total	2,320	2,750	4,060	1,930	4,600	1,700

RUBBER futures prices on the Commodity Exchange rose irregularly during March, buoyed up by an increase in short covering and by rising prices on the London and the Singapore markets. The foreign advance was based on reports of increased rubber shipments to England and Europe, a rumored decline in Malayan and Burmese rubber production owing to increased guerrilla activities, and a resumption of Russian buying. The Soviet Government ordered a further 10,000 tons of Malayan rubber, bringing its total purchases for the first quarter to approximately 45,000 tons.

Activity was only moderate on the Exchange, and there was a tendency to await results of the Rubber Study Group meeting in London. The principal topic of discussion at the meeting will be American rubber needs and demand, for the key to the rubber market still lies in American consumption.

May futures in the No. 1 Contract opened the month at 18.53¢ rose slowly to a high of 19.53¢ on March 18, and closed the month at 18.98¢. September futures started the month at 18.10¢, reached a high of 19.10¢ on March 18, and closed at 18.53¢ on March 31. Trading was very light in the old Standard Contract, with only 240 tons sold during March, as compared with 680 tons sold in February. The No. 1 Contract saw a total of 13,740 tons sold in March, as compared with 16,450 tons in the previous month. Total sales for March in both contracts was 13,980 tons, compared with 17,130 tons sold in February.

New York Outside Market

WEEK-END CLOSING PRICES

	Jan. 29	Feb. 26	Mar. 5	Mar. 12	Mar. 19	Mar. 26
No. 1 R.S.S.						
Mar.	19.13	18.38	19.00	19.13	19.63	18.75
Apr.-June	19.00	18.25	19.00	19.00	19.50	18.75
July-Sept.	18.88	18.13	18.88	18.88	19.38	18.63
Oct.-Dec.	18.75	18.00	18.75	18.75	19.25	18.50
No. 3 R.S.S.	18.13	17.38	17.88	17.88	18.13	17.25
No. 2 Brown	15.00	15.25	15.50	15.63	15.25	15.25
Flat Bark	12.13	12.25	12.38	12.38	12.50	12.13

AS USUAL, price movements on the New York Outside Market during March conformed with those in the futures market. Prices rose slowly during the first part of the month, following the trend of foreign physical markets and bolstered by good domestic demand. Toward the end of the month there was a sharp slackening of factory demand, but prices remained firm in view of the small tonnages of rubber being received at New York.

The No. 1 R.S.S. spot price started the month at 18.75¢, rose to a high of 19.63¢ on March 18, and closed at 19.00¢ on March 31. The price for No. 3 R.S.S. rose from 17.50¢ on March 1 to a high of 18.25¢ on March 16, then fell off to end the month at 17.50¢. No. 2 Brown moved through a price range of 15.25¢-16.00¢; while Flat Bark fluctuated between 12.25¢ and 12.63¢ throughout the month.

Latices

DOMESTIC *Hevea* latex consumption in 1950-1952 is estimated at substantially more than the 32,000-38,000 tons predicted for 1949, according to Arthur Nolan, Latex Distributors, Inc., writing in Lockwood's March *Rubber Report*. The government estimate of 50,000 tons of latex needed in the domestic market in 1947 missed the mark by what now appears to be more than three years, and increased production to meet this estimate only succeeded in glutting the market. Domestic consumption of *Hevea* latex is expected to increase regularly as foam manufacture is expanding. Consumption of latex throughout the rest of the world is also rising. 1949 is expected to be a year of readjustment, and 1950 shows promise of being an important year for the latex industry.

Mr. Nolan gives final December statistics for *Hevea* latex as follows: imports, 4,214 long tons, dry weight; consumption, 2,428 long tons; and year-end stocks, 11,235 long tons. Totals for 1948 show a consumption of 28,489 long tons, dry weight, and imports of 32,633 long tons. Preliminary estimates for January include imports of 1,132 long tons, dry weight; consumption, 2,315 long tons; and month-end stocks, 9,927 long tons. January production of GR-S latex is estimated at 1,297 long tons, dry weight. There were no changes in latex prices during February.

SCRAP RUBBER

A SOMEWHAT steadier tone was noted in the scrap rubber market during March. Supplies moved a little more freely, but total volume was still limited and confined only to certain desirable grades. Most buying was reported to be for export, with red tubes in greatest demand. Early in the month there was a good deal of export buying for Spain in tubes, mechanical scrap, tires, peelings, airbags, and tire fabrics, in addition to plastic scrap. This buying, which slackened toward the middle of March, was said to have been mainly on a barter arrangement, although some payments were reported made in sterling. A tender for 5,000 tons of scrap rubber, consisting of tire peelings and inner tubes, in minimum lots of 200 tons, was received from the Japanese Board of Trade, although no Japanese orders had been expected before April. Inquiries for scrap rubber supplies by ECA to Bizonia have not as yet reached the market, although some tentative buying on that basis is reported to have taken place.

Following are dealers' selling prices for scrap rubber, in carload lots, delivered to mills at points indicated:

	Eastern Points	Akron, O.
	(Per Net Ton)	
Mixed auto tires	$12.50	$13.50
Peelings, No. 1	55.00	55.00
3	33.00	33.00
	(¢ per Lb.)	
Black inner tubes	4.50	5.00
Red passenger tubes	7.50	7.50

RECLAIMED RUBBER

THE reclaimed rubber market showed no change during March. Business was good, with production and consumption both at relatively high levels.

Final December and yearly total 1948 and preliminary January statistics on the domestic reclaimed rubber industry are now available. Production of reclaim during December totaled 21,430 long tons; consumption, 21,377 long tons; exports, 1,375 long tons; and month-end stocks, 32,630 long tons. Final statistics for the year 1948 are: production, 266,861 long tons; consumption, 261,113 long tons (including a year-end adjustment of —12,336 long tons); exports, 11,428 long tons; and year-end stocks, 32,630 long tons. Preliminary figures for January show a production of 19,699 long tons; consumption, 21,103 long tons; export, 912 long tons; and end-of-month stocks, 34,564 long tons.

No changes occurred in reclaimed rubber prices last month, and current prices follow:

Reclaimed Rubber Prices

	Sp. Gr.	¢ per Lb.
Whole tire	1.18-1.20	8.5 / 9
Peel	1.18-1.20	8.5 / 9.5
Inner tube		
Black	1.20-1.22	12.75/13.75
Red	1.20-1.22	14 /14.5
GR-S	1.18-1.20	9.5 /10
Butyl	1.16-1.18	8.5 / 9
Shoe	1.50-1.52	8.25/ 8.75

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

RAYON

DELIVERIES of rayon by producers to domestic consumers during January amounted to 87,600,000 pounds. Preliminary shipment figures for February show 78,000,000 pounds, a decline of 11% from January. January rayon filament yarn deliveries totaled 69,800,000 pounds, of which 44,800,000 pounds were viscose and cupra and 25,000,000 pounds were acetate. February yarn deliveries reached 63,000,000 pounds, composed of 41,000,000 pounds of viscose and cupra and 22,000,000 pounds of acetate. Rayon staple deliveries also declined from 17,800,000 pounds in January to 15,000,000 pounds in February. Producers' stocks of filament yarn increased from 15,200,000 pounds at the end of January to 21,000,000 pounds on February 28.

CLASSIFIED ADVERTISEMENTS
Continued

MACHINERY & SUPPLIES FOR SALE

FOR SALE: 1—WATSON STILLMAN LOW AND HIGH HYDRO-Pneumatic Accumulator (3000#) pressure with pumps, motors, and accessories. 1—48 x 48" 3-opening Hydraulic Press with 4-16" rams; other presses, various sizes. 1—5' x 24' Vulcanizer, 100# pressure, quick-opening door. 6—Royle and other Tubers 2⅛ to 8". Also mills, calenders, etc. Send us your inquiries. CONSOLIDATED PRODUCTS CO., INC., 13-16 PARK ROW, NEW YORK 7, NEW YORK. Telephone: BArclay 7-0600.

FOR SALE: FARREL 15" X 36", 2-ROLL RUBBER MILL, ALSO Lab. 6" x 12" & other sizes up to 84"; Rubber Calenders; Extruders 2" to 6"; Baker Perkins 200 gal. & 100 gal. double-arm, jack. Mixers, also 9 and Lab. 0.7 gals.; Large stock Hydraulic Presses from 12" x 12" to 42" x 48" platens, from 50 to 1,500 tons; Hydraulic Pumps & Accumulators; Injection Molding Machines 1 to 16 oz.; Stokes & Colton single-punch & rotary preform Tablet Machines, ½" to 2½"; Banbury Mixers; Rotary Cutters; Grinders & Crushers, etc. SEND FOR SPECIAL BULLETIN. WE BUY YOUR SURPLUS MACHINERY. STEIN EQUIPMENT COMPANY, 90 WEST STREET, NEW YORK 6, N. Y.

FOR SALE—NO. 1 BANBURY MIXER WITH STRUCTURAL steel for mezzanine installation over 60" mill. Extra set new rotors. McCord lubricator. Potentiometer. Clock. 50 H.P. 60-cycle 440-volt 3-phase motor. Reduction gear. Excellent condition. Recently overhauled. PATTERSON-BALLAGH, 1900 E. 65th St., Los Angeles 1, Calif. Telephone LOgan 3246.

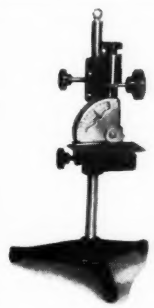
FOR SALE—100 H. P. G-E INDUCTION MOTOR, 440-VOLT A. C., 60-cycle, 3-phase, 880 RPM, Model 5K6325DY1. Extra rotor shaft. Compensator. Practically new. PATTERSON-BALLAGH, 1900 E. 65th St., Los Angeles 1, Calif. Telephone LOgan 3246.

RECONDITIONED F. J. STOKES MACH. CO. RD-4 ROTARY 16-Punch preform presses, 10-ton pressure; Baker Perkins 15 gal. Vacuum Mixer double-arm, jktd.; W & P 100 gal. double-arm jktd. mixer. PERRY EQUIPMENT CORP., 1524 W. Thompson St., Phila. 21, Pa.

FIVE (5) 300-TON FRENCH OIL MACHINERY COMPANY presses complete with pull-backs and four-way operating valves. 19" rams and die bed 20" x 28". Rated ram pressure 2500 p.s.i. 15" stroke. $2,900 each "as is, where is." In operable condition.

Two (2) 100-150-ton Stokes-Standard Presses with self-contained hydraulic systems. Die bed 23" x 28" and press stroke 7". $1,900 each, "as is, where is." In operable condition. Address Box No. 329, care of INDIA RUBBER WORLD.

READY, COMPLETELY REBUILT #9 BANBURY MIXER bodies, spray or jacketed, exchange for worn bodies and save time. All sizes rebuilt to order. INTERSTATE WELDING SERVICE, 914 Miami Street, Akron 11, Ohio.



(Classified Advertisements Continued on Page 141)

Domestic rayon producers, faced with the necessity of either reducing rayon prices or cutting back production, began to reduce production last month. American Viscose Corp. announced a 12% cutback in production of viscose filament yarn; while Celanese Corp. of America began to utilize its capacity for twisted package yarns, which are in greater demand. Producers are hesitant to step up tire yarn production to make up for losses in other yarns in order to avoid trouble in the event of any large decrease in tire production.

Current prices for rayon tire yarn and fabric are listed below:

Rayon Fabrics

Tire Yarns			
1100/480	$0.55	/	$0.57
1100/490	.57		
1150/490	.57		
1650/720	.54	/	.56
1650/980	.56		
1900/980	.56		
2200/960	.53		
2200/980	.55		
Tire Fabrics:			
1100/490/2	.71		
1650/980/2	.685	/	.70
2200/980/2	.67		

COTTON AND FABRICS

New York Cotton Exchange
Week-End Closing Prices

Futures	Jan. 29	Feb. 26	Mar. 5	Mar. 12	Mar. 19	Mar. 26
May	32.46	32.28	32.33	32.08	32.21	32.20
July	31.37	31.08	31.20	30.85	31.06	31.13
Oct.	28.72	28.16	28.24	28.11	28.14	28.30
Dec.	28.49	27.95	28.02	27.91	27.95	28.07
1950						
Mar.	28.36	27.83	27.89	27.79	27.83	27.91
May	28.13	27.60	27.67	27.56	27.61	27.67

LAST month cotton was quiet on the New York Cotton Exchange, with prices moving irregularly in a very narrow range. In general, traders were holding back and awaiting new export demand before making any commitments. What little activity was noted during March came after reports of export inquiries. France was reported ready to enter the market for 100,000 bales. It was also said that Japan will take an additional 40,550 bales for delivery in April, May, and June. Great Britain was also expected to enter the market shortly, but purchases by India and Spain remained in doubt.

Reports from Washington that the compromise farm bill might mean continuation of 90% of parity loans for the 1950-51 crop failed to affect value. The final crop report for 1948-49, released March 21, likewise had no effect on prices although it placed production at 14,834,769 bales, off 102,000 bales from the December estimate. This was understandable in view of the existing cotton surplus and prospects for another big crop apparently on the way.

The 15/16-inch middling spot price began the month at 33.42*c*, reached a high of 33.64*c* on March 5, and thereafter fluctuated irregularly to close the month at 33.57*c*. May futures prices showed similar movement, starting the month at 32.15*c*, reaching a high of 32.33*c* on March 5, and closing the month at 32.27*c*.

Fabrics

The year's first clear break in wide industrial gray goods prices came at the end of the first week in March when producers cut chafer and certain wide duck prices. These price reductions failed to increase appreciably sales volume, reported below production rates. Hose and belting ducks declined from 66.5*c* a pound to 64*c* and were reported to be selling well for spot and April deliveries. Numbered ducks continued to be quoted at 45% off the list price. Sateens were fairly strong pricewise and selling in good volume, although not so well as in recent months.

Wide drills were firm in price, with some constructions selling into May. Enameling ducks continued on the weak side, but headlinings sold well to the automotive trade. The sheeting market had many inquiries, but only moderate sales volume. Prices for osnaburgs were largely unchanged, and sales held at moderate levels, although the price for the 40-inch 3.65-yd. construction dropped from 15.25*c* to 14.25*c*.

Current prices for cotton fabrics follow:

Cotton Fabrics

Drills		
59-inch 1.85-yd	*yd.*	$0.375
2.25-yd		.33
Ducks		
38-inch 1.84-yd. S. F.	*yd.*	.425
2.00-yd. D. F.		.325
40-inch 1.45-yd. S. F.		.43
51.5-inch 1.35-yd. S. F.		.52
Hose and belting		.64
Osnaburgs		
40-inch 3.65-yd	*yd.*	.1425
Raincoat Fabrics		
Bombazine, 64 x 60 5.35-yd.	*yd.*	.225
Print cloth, 38¼-inch, 64 x 60		.15
Sheeting, 48-inch, 4.17-yd.		.23
52-inch 3.85-yd		.2488
57-inch 3.47-yd.		.2763
60-inch 3.30-yd		.2913
Chafer Fabrics		
14-oz./sq. yd. Pl.	*lb.*	.70
11-65-oz./sq. yd. S		.64
10-80-oz./sq. yd. S.		.66
8.9-oz./sq. yd. S.		.69
14-oz./sq. yd. S.		.63
Other Fabrics		
Headlining, 59-inch 1.35-yd, 2-ply	*yd.*	.565
64-inch 1.25-yd. 2-ply		.6063
Sateens, 53-inch 1.32-yd.		.58
58-inch 1.21-yd		.6375

Rims Approved and Branded by The Tire & Rim Association, Inc.

Rim Size	Feb., 1949
15" & 16" D. C. Passenger	
15x3.50D	15,120
16x4.00E	153,592
15x4.50E	7,750
16x4.50E	199,995
15x5.00E	117,323
16x5.00F	19,533
15x5.50F	26,677
16x5.50F	16,904
16x6.00F	5,480
16x4.00E—Hump	4,770
16x4.50E—Hump	16,822
15x4½-K	61,926
16x4½-K	73,967
15x5-K	290,345
16x5-K	14,903
15x5½-K	265,236
16x5½-K	361
15x6-L	116,574
16x6-L	5,046
15x6½-L	125,428
15x4½-K—Hump	171,954
15x5-K—Hump	84,493
15x5½-K—Hump	42,717
15x6-L—Hump	5,369
17" & Over	
18x2.15B	102
19x2.15B	2,146
18x4.00F	2,771
Truck-Bus	
20x4.33R	5,140
17x5.0	27,916
18x5.0	5,376
20x5.0	24,269
17x5.00R	9,761
20x5.00R	30,739
20x5.00S	10,662
24x5.00S	303
17x5.5	6,232
20x5.5	525
15x5.50S	519
20x5.50S	7,509
17x6.0	5,150
20x6.0	139,824
20x6.00S	74,014
15x6.00T	559
20x6.00T	1,071
15x6.50T	1,902
20x6.50T	9,661
15x7.0	641
20x7.0	1,465
20x7.00T	12,733
22x7.33V	75
20x7.5	12,165
22x7.5	8,551
20x7.50V	7,040
20x7.50V—Flat Base	7,885
22x7.50V	6,641
22x7.50V—Flat Base	2,638
20x8.0	894
22x8.0	981
24x8.0	639
20x10.0	1,213
20x10.00W	459
24x10.00W	3,574
Semi D. C. Truck	
16x4.50E	16,925
15x5.50F	41,632
16x5.50F	5,392
16x6.50H	4,460
Tractor & Implement	
12x2.50C	10,754
12x3.00D	31,962
15x3.00D	29,081
18x3.00D	2,597
19x3.00D	23,049
21x3.00D	3,822
36x3.00D	2,005
40x3.00D	261
16x4.25KA	2,143
20x4.50E	6,166
12x5.00JA	733
13x5.50F	3,119
18x5.50F	8,332
24x5.50R	3,580
40x5.50R	223
24x6.00S	301
36x6.00S	252
24x8.00T	6,424
28x8.00T	678
32x8.00T	891
36x8.00T	1,375
W5-30	4,913
W6-24	11,641
W7-24	14,003
W7-36	1,586
W8-24	6,788
W8-24(H)	11,020
W8-32	378
W8-34	1,290
W8-36	3,152
W8-38	389
W9-24	5,995
W9-28	32,014
W9-36	2,485
W9-38	2,008
W10-28	4,573
W10-38	2,580
W13-26	1,218
DW9-38	2,978
DW10-36	62
DW10-38	7,602
DW11-24	1,940
DW11-26	493
DW11-28	701
DW11-38	13,452
DW12-26	1,605
DW12-30	4,293
DW12-34	3,477
DW14-30	2,109
DW14-34	851
Industrial	
8x2.50C	136
10x5.00F	136
12x5.00S	119
Earth Mover	
20x11.25	613
24x11.25	402
24x13.00	198
24x15.00	422
25x15.00	29
25x17.00	27
29x17.00	12
33x22.00	94
Total	2,629,971

Compounding Ingredients Price Changes and Additions

Emersol 110	*lb.*	$0.165	/	$0.175
120	*lb.*	.17	/	.18
130	*lb.*	.1925	/	.2025
210 Elaine	*lb.*	.1275	/	.15
Litharge, Eagle	*lb.*	.2075	/	.2085
Red lead, Eagle	*lb.*	.2175		
White lead, basic, Eagle	*lb.*	.1925	/	.2025
Silicate, Eagle	*lb.*	.215	/	.2325
Zinc oxide, Lehigh, 35% leaded		.165	/	.1675
50% leaded	*lb.*	.167⁄8	/	.17⅛

Estimated Automotive Pneumatic Casings and Tube Shipments, Production, and Inventory—January, 1949; December, January, 1948

	January, 1949	% of Change from Preceding Month	1948 December	1948 January
Passenger Casings				
Shipments				
Original equipment	1,905,612		1,897,127	1,865,215
Replacement	2,301,919		2,351,383	2,804,753
Export	41,505		71,685	67,130
TOTAL	4,249,036	−1.65	4,320,195	4,737,098
Production	4,772,116	+3.52	4,609,669	6,438,955
Inventory end of month	9,319,292	+6.03	8,788,907	7,074,922
Truck and Bus Casings				
Shipments				
Original equipment	398,353		402,033	464,553
Replacement	552,863		601,330	627,866
Export	85,151		118,968	89,509
TOTAL	1,036,367	−7.66	1,122,331	1,181,928
Production	1,123,820	+1.67	1,105,386	1,411,967
Inventory end of month	2,020,154	+4.50	1,933,166	1,730,994
Total Automotive Casings				
Shipments				
Original equipment	2,303,965		2,299,160	2,329,768
Replacement	2,854,782		2,952,713	3,432,619
Export	126,656		190,653	156,739
TOTAL	5,285,403	−2.89	5,442,526	5,919,026
Production	5,895,936	+3.16	5,715,055	8,850,923
Inventory end of month	11,339,446	+5.76	10,722,073	8,805,916
Passenger and Truck and Bus Tubes				
Shipments				
Original equipment	2,297,823		2,289,898	2,326,513
Replacement	2,531,067		2,308,231	2,630,780
Export	96,657		124,235	80,548
TOTAL	4,925,547	+4.30	4,722,364	5,037,841
Production	5,062,357	+.57	5,033,856	2,228,045
Inventory end of month	9,814,837	+.83	9,734,190	9,115,605

SOURCE: The Rubber Manufacturers Association, Inc., New York, N. Y.

Unclassified

(Continued from page 122)

Francisco, Calif., U.S.A.

454,386. **Anti-Skid Device.** J. J. Cook, assignor to John J. Cook Mfg. Corp., both of Detroit, Mich., U.S.A.

454,415. **Hose Coupling.** A. C. Lusher, E. H. Tompkins, and G. G. Howard, assignors to Scovill Mfg. Co., all of Waterbury, Conn., U.S.A.

454,567. **Knock-Down Garden Hose Reel.** J. A. Morrone, Westerly, R. I., U.S.A.

454,575. **Tire Tool.** E. P. Rundell, Toponas, Colo., U.S.A.

454,626. **Balloon Inflating Valve.** L. W. Isom, Belmont, and E. E. Habid, Arlington, assignors to Dewey & Almy Chemical Co., Cambridge, all in Mass., U.S.A.

United Kingdom

615,288. **Devices to Seal the Ends of Electric Cables.** Pyrotenax, Ltd., and G. D. Clothier.

615,661. **Tire Pressure Indicator.** A. Fernandez-Yanez Y Martinez Del Campo and J. Fernandez-Yanez Y Ozores.

615,766. **Distensible Actuating Means for Brake and Clutch Apparatus.** Dunlop Rubber Co., Ltd. and H. J. Butler.

615,926. **Carding Machine Attachment for Controlling the Web Weight.** United States Rubber Co.

615,960. **Tire Removing Apparatus.** Firestone Tire & Rubber Co.

616,230. **Lever Mechanisms.** Dunlop Rubber Co., Ltd., and H. Trevaskis.

TRADE MARKS

United States

441,953. **Koroseal.** Sheet plastic film. B. F. Goodrich Co., Akron, O.

441,967. Representation of a rectangle containing the word: **"Formetics."** Forms to mold and shape garments, shoulder pads, etc. Seely Shoulder Pad Corp., New York, N. Y.

441,999. Representation of a line below the word: **"Golfcraft."** Golf balls. Golfcraft, Inc., Chicago, Ill.

442,001. The letter: **"G,"** and superimposed thereon a representation of a semi-circle containing the letter: **"M."** Athletic equipment. Sport Products, Inc., Cincinnati, O.

442,012. **Arcor.** Toys. Auburn Rubber Corp., Auburn, Ind.

442,086. Representation of a rectangle containing the words: **"Better Finishes Thru Research."** Rubber-based paints, etc. Jamestown Finishing Products, Inc., Jamestown, N. Y.

442,106. **Zinsper.** Zinc soap used as a dispersing and activating agent for natural and synthetic rubber formulations. Witco Chemical Co., Chicago, Ill.

506,169. **Tri-Form.** Dress shield and shoulder pad bodices. I. B. Kleinert Rubber Co., Inc., New York, N. Y.

506,175. **Young's.** Footwear. Young's Speedy Shoes, Inc., Los Angeles, Calif.

506,189. **Summerettes.** Footwear. Mishawaka Rubber & Woolen Mfg. Co., Mishawaka, Ind.

506,195. **Radiant Arch.** Footwear. Powell & Campbell, Inc., New York, N. Y.

506,207. Representation of a line below the words: **"Black Bros."** Belts, suspenders, etc. Black Mfg. Co., Seattle, Wash.

506,208. **Briarcliff.** Belts, suspenders, and garters. Perfect Belt Mfg. Co., Atlanta, Ga.

506,221. **Ledbury.** Raincoats. Meier & Frank Co., Inc., doing business as Meier & Frank Co., Portland, Oreg.

506,243. **Nice Going.** Footwear. Huiskamp Bros. Co., Keokuk, Iowa.

506,313. **Rainbow.** Windshield wiper blades. Trico Products Corp., Buffalo, N. Y.

506,334. Representation of a line below the word: **"Rheeflex."** Rubber threads. Rhee Elastic Thread Corp., Warren, R. I.

506,370. **Extendo.** Foundation garments and girdles. Artistic Foundations, Inc., New York, N. Y.

506,426. **Kralac.** Thermoplastic resins. United States Rubber Co., New York, N. Y.

506,460. Representation of a top and the words: **"Green Top."** Tire and tube repair kits. Inland Rubber Corp., Chicago, Ill.

506,461. **Paranite.** Mechanical rubber goods. Raybestos-Manhattan, Inc., Passaic, N. J.

506,484. **Devon.** Windshield wipers. Windsor-Lloyd Products, Inc., Wilmington, Del.

506,494. **Armortite.** Electric cable. Okonite Co., Passaic, N. J.

506,497. **Li-Lo.** Druggists' sundries. P. B. Cow & Co., Ltd., London, England.

506,519. Representation of a line below the words: **"Colostom-Ease."** Colostomy irrigators and protectors. Colostom-Ease Inc., Pittsburgh, Pa.

506,520. **Prime.** Athletic supporters. Kendall Co., Boston, Mass.

506,548. **Elvanol.** Vinyl polymers. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

506,552. **Hinj.** Emulsifying, dispersing, solubilizing, and wetting agents. Atlas Powder Co., Wilmington, Del.

506,588. **Frisco.** Auto mat pads. Fritzsche Tire & Reliner Co., Chicago, Ill.

506,594. **"Key-Lok".** Brake linings and blocks. Raybestos-Manhattan, Inc., Passaic, N. J.

506,599. **Eveready.** Nursing bottles. Seamless Rubber Co., New Haven, Conn.

506,646. **XIOL.** Basketballs. Sport Products, Inc., Cincinnati, O.

506,668. **Reliable.** Storage batteries. Standard Electric Co., Inc., San Antonio, Tex.

506,689. **DL.** Basketballs. A. G. Spalding & Bros., Inc., Chicopee, Mass.

506,690. **Young Star.** Sporting goods. A. G. Spalding & Bros., Inc., Chicopee, Mass.

506,787. **Kindlerite.** Stove wicking. Raybestos-Manhattan, Inc., Passaic, N. J.

506,896. Representation of an arc containing the word: **"Manhattan."** Abrasive wheels. Raybestos-Manhattan, Inc., Passaic, N. J.

506,903. **Dehydrapac.** Packaging materials. Shellmar Products Corp., Chicago, Ill.

506,905. Representation of a circle containing two stars and the letter: **"H."** Erasers. L. & C. Hardtmuth, Inc., Bloomsbury, N. J.

506,931. **Triple Traction.** Tires. Corduroy Rubber Co., Grand Rapids, Mich.

506,941. **Airlox.** Inner tubes. Polson Rubber Co., Garrettsville, O.

506,943. **Saturex.** Paper for impregnation with natural or synthetic rubber latices, etc. Hollingsworth & Vose Co., East Walpole, Mass.

506,957. **Spencer-All.** Corsets, girdles, etc. Berger Bros. Co., New Haven, Conn.

507,021. **Elvacet.** Polymerized vinyl ester or esters. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

507,065. Representation of a line below the word: **"Steelmaster."** Tires. United States Rubber Co., New York, N. Y.

507,100. **Grip-Shur.** Liquid belt dressing. Victor Balata & Textile Belting Co., New York, N. Y.

507,101. **Shur-Safe.** Inner tubes. Robbins Tire & Rubber Co., Inc., Tuscumbia, Ala.

507,115. **Rubber Gard.** Rubber-base paints. Wilbur & Williams Paint Corp., Boston, Mass.

Foreign Trade Opportunities

The firms and individuals listed below have recently expressed their interest in buying in the United States or in United States representations. Additional information concerning each import or export opportunity, including a World Trade Directory Report, is available to qualified United States firms and may be obtained upon inquiry from the Commercial Intelligence Unit of the United States Department of Commerce, Washington, D. C., or through its field offices, for $1 each. Interested United States companies should correspond directly with the concerns listed concerning any projected business arrangements.

Import Opportunities

Etablissement Enomis, L. Meers, 11 Blvd. Felix Paulsen, Brussells, Belgium: trusses, medical belts, elastic stockings, elastic fabric.

Busho Shokai, 8-1 chome, Fukawaga, Sagacho, Koto-ku, Tokyo, Japan: rubber goods, beach balls, toys.

Nippon Trade, Inc., No. 16 Nichome Kitahama, Higashiku, Osaka, Japan: rubber products such as bicycle tires and tubes, beach balls, and pipes.

Moji Chikuzai Boeki Co., Ltd., 4, 1-chome Shiba Tamuracho, Minatoku, Japan: sporting goods.

Yashima Trading Co., Ltd., c/o Mitsui Third Bldg., Nihonbashi, Tokyo, Japan: golf balls.

Export Opportunities

Jean Roblin, representing de Ariel, S. A., 44 Ave. de la Grande Armée, Paris, France: waterproof clothing, rubber balloons.

H. E. Teifel & Co., Maritime House, Loveday St., Johannesburg, Union of South Africa: vinyl resins, polyethylene film and tube.

N. V. Inovex (Internationale Organisatie voor Im- en Export), 109-11 Rokin, Amsterdam, Netherlands: technical rubber, textiles.

La Courroie Industrielle S. A., Belgium: rubber V-, conveyer, and transmission belting.

Fratelli Traverso, via Cairoli 27, Ovada, Alessandria, Italy: worn-out plane and auto tires to be made into rubber soles.

Anton Helffer, 611 Amstelveenseweg, Amsterdam Z, representing Firma A. Helffer, 21 Leidsegracht, Amsterdam C, Netherlands: electrical insulating material and copper wire.

Giuseppe Piccagliani, 87 Via Emilia, Modena, Italy: raincoats.

Walter Scheufelen, Dettinger Strasse 85, Kirchheim-Teck (U. S. Zone), Germany: rubber goods for household and industrial plants.

Busho Shokai, 8-1 chome, Fukagawa, Sagacho, Koto-ku, Tokyo, Japan: automotive parts and accessories, ball bearings, chemicals.

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Continued

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United States Imports, Exports, and Reexports of Crude and Manufactured Rubber

Imports for Consumption of Crude and Manufactured Rubber

	December, 1948 Quantity	December, 1948 Value	Yearly Totals, 1948 Quantity	Yearly Totals, 1948 Value
UNMANUFACTURED, Lbs.				
Crude rubber	186,858,457	$35,495,327	1,567,907,665	$289,643,602
Rubber latex	9,443,079	2,366,959	73,872,327	18,316,078
Guayule			677,400	71,330
Balata	185,497	56,896	2,866,727	888,700
Jelutong or Pontianak	236,601	108,975	7,618,918	2,377,765
Gutta percha	34,049	12,324	947,884	542,788
Chicle	2,470,537	1,818,921	9,268,038	6,864,205
Synthetic rubber	3,247,647	606,106	32,575,556	5,979,928
Reclaimed rubber			23,128	1,745
Scrap rubber	1,880,781	31,596	15,125,304	296,983
TOTALS	204,376,648	$40,497,104	1,711,182,947	$324,993,124
MANUFACTURED				
Tires: auto, bus, and truck *no.*	243	$2,984	4,332	$63,348
Bicycle *no.*	1,046	1,453	17,923	23,827
Other *no.*			4,520	4,099
Inner tubes *no.*	240	538	1,773	4,593
Rubber footwear: Boots *prs.*	28,548	48,860	93,111	147,586
Shoes and overshoes *prs.*	12,630	16,202	121,359	138,758
Rubber-soled canvas shoes *prs.*	24,773	12,942	138,407	80,286
Rubber balls: golf *no.*			93,012	36,911
Tennis *no.*	432	158	6,064	2,324
Other athletic *no.*	173,460	18,039	1,172,891	129,381
Rubber toys, except balloons		2,422		14,019
Hard rubber products		235		22,521
Rubberized printing blankets *lbs.*			3,196	6,508
Rubber and cotton packing *lbs.*			17,652	21,739
Gaskets and valve packing		37		2,666
Molded electrical insulators				1,160
Rubber belting *lbs.*	8,576	12,362	29,838	44,026
Hose and tubing		1,050		1,972
Heels and soles *lbs.*			25,547	2,763
Golf ball centers *doz.*			85	242
Rubber bands *lbs.*	1,654	668	10,564	5,020
Instruments *doz.*	35	107	255	591
Substitutes, advanced *lbs.*			5,526,324	454,808
Soft rubber products		8,640		131,103
Other rubber products		703		2,915
Synthetic rubber goods		11,545		26,826
Gutta percha manufactures *lbs.*			37	98
TOTALS		$582,568		$1,813,813
GRAND TOTALS, ALL RUBBER IMPORTS		$41,079,672		$326,806,937

Reexports of Foreign Merchandise

	December, 1948 Quantity	December, 1948 Value	Yearly Totals, 1948 Quantity	Yearly Totals, 1948 Value
UNMANUFACTURED, Lbs.				
Crude rubber	1,274,406	$250,540	14,995,591	$3,232,324
Balata	2,231	1,300	107,237	59,400
Jelutong & gutta percha			85,549	43,743
Chicle			11,129	12,580
Synthetic rubber			14,244	2,715
Scrap rubber	232,954	11,476	232,954	11,476
TOTALS	1,509,591	$263,316	15,446,704	$3,362,238
MANUFACTURED				
Rubber cement *gals.*			1,825	$2,023
Footwear: boots *prs.*			746	2,155
Shoes and overshoes *prs.*			144	588
Gloves and mittens *doz. prs.*			130	663
Soling and toplift sheets *lbs.*	8,811	$5,085	12,804	7,324
Dug sundries: syringes and water bottles *no.*			720	210
Other		6,349		44,664
Balloons				145
Rubber toys and balls		724		5,213
Tire casings, and tubes, except auto *no.*			3,250	6,695
Solid tires, auto and truck *no*			16	204
Hard rubber goods, except battery boxes *lbs.*			165	53
Rubber and friction tape *lbs.*			100	90
Belting: auto fan belts *lbs.*			400	505
Other *lbs.*			14,873	15,576
Hose and tubing: Garden *lbs.*			1,469	819
Other *lbs.*	400	100	6,591	3,564
Rubber packing *lbs.*	264	216	1,655	989
Erasers *lbs.*			750	144
Rubber mats, flooring, tiling *lbs.*			350	247
And rubberized clothing				272
Latex and other compounded rubber for further manufacture *lbs.*			67,810	19,036
Other rubber products		1,610		8,023
TOTALS		$14,084		$118,202
GRAND TOTALS,		$277,400		$3,480,440

Exports of Domestic Merchandise

	December, 1948 Quantity	December, 1948 Value	Yearly Totals, 1948 Quantity	Yearly Totals, 1948 Value
UNMANUFACTURED, Lbs.				
Crude rubber			68,367	$22,822
Chicle	53,846	$27,709	690,929	361,533
Balata	1,100	3,645	32,778	72,687
Jelutong & gutta percha			1,196	2,735
Synthetic rubber: GR-S	61,429	17,083	2,449,751	547,757
Butyl	2,337	491	38,496	8,467
Neoprene	640,408	223,979	6,428,641	2,149,806
Nitrile	360,394	147,786	1,978,018	805,696
"Thiokol"	6,190	2,985	34,344	18,387
Polyisobutylene	3,273	1,047	74,675	24,382
Other	14,511	10,742	378,582	111,296
Reclaimed rubber	3,080,397	257,829	25,059,609	2,033,053
Scrap rubber	8,470,947	260,578	51,390,283	1,523,286
TOTALS	12,694,832	$953,694	88,625,669	$7,681,907
MANUFACTURED				
Rubber cement *gals*	46,283	$58,420	497,224	$673,039
And rubberized fabric: auto cloth *sq. yds.*	91,834	83,088	1,417,965	1,006,794
Piece goods and hospital sheeting *sq. yds.*	180,660	139,338	997,383	785,518
Footwear: boots *prs.*	9,609	46,015	269,942	938,801
Shoes and overshoes *prs.*	12,809	25,822	225,994	363,304
Rubber-soled canvas shoes *prs.*	65,904	132,998	1,066,721	1,818,134
Soles *doz. prs.*	38,628	120,148	325,857	841,617
Heels *doz. prs.*	126,530	129,878	682,745	590,990
Rubber soling and toplift sheets *lbs.*	195,986	49,649	1,571,723	405,267
Gloves and mittens *doz. prs.*	17,423	55,923	164,652	516,093
Drug sundries: syringes and water bottles *no.*	39,478	26,137	387,988	239,118
Other		199,213		2,554,779
Rubber and rubberized clothing		68,119		928,889
Balloons		144,265		1,220,341
Toys and balls		35,677		579,335
Bathing caps *doz.*	1,869	5,529	20,912	71,364
Rubber bands *lbs.*	3,738	3,232	43,199	35,796
Erasers *lbs.*	22,913	16,945	236,110	186,306
Hard rubber goods: battery boxes *no.*	32,517	46,935	454,695	527,543
Other electrical goods *lbs.*	105,382	50,118	1,429,742	721,691
Combs, finished *doz.*	6,460	9,280	87,323	78,235
Other		15,340		191,995
Tire casings: truck and bus *no.*	118,775	5,188,035	1,162,282	50,260,133
Auto *no.*	69,115	994,138	629,297	8,957,793
Inner tubes: auto, truck, bus *no.*	134,628	500,012	1,201,544	4,445,807
Other casings and tubes, except auto *no.*	67,258	1,402,729	668,917	10,950,446
Solid tires: auto and truck *no.*	6,460	218,452	111,232	3,092,000
Other *lbs.*	34,053	9,669	622,312	310,446
Tire repair materials: camelback *lbs.*	117,006	31,292	1,395,244	397,160
Other *lbs.*	136,405	68,041	1,861,596	947,065
Rubber and friction tape, except medical *lbs.*	59,500	43,518	628,591	441,582
Belting: auto fan belts *lbs.*	100,528	117,562	976,702	1,113,756
Other rubber and balata belting *lbs.*	889,544	854,477	15,994,591	13,370,739
Hose and tubing: garden hose *lbs.*	22,085	10,743	994,723	325,559
Other *lbs.*	790,469	550,373	7,384,372	5,399,788
Rubber packing *lbs.*	149,733	135,078	1,966,809	1,645,188
Mats, flooring, tiling *lbs.*	942,815	232,888	7,836,585	1,984,641
Thread: bare *lbs.*	40,911	57,716	389,889	590,170
Textile covered *lbs.*	9,853	23,833	169,452	400,393
Gutta percha manufactures *lbs.*	4,603	9,365	98,118	90,936
Latex and other compounded rubber for further manufacture, *lbs.*	357,790	140,544	4,421,042	1,519,792
Other rubber products		338,051		3,645,944
TOTALS		$12,388,585		$125,161,491
GRAND TOTALS, ALL RUBBER EXPORTS		$13,342,279		$132,843,398

SOURCE: Bureau of Census, United States Department of Commerce, Washington, D. C.

"Calcene T—A Low Cost Replacement for Some Thermal Blacks." R. F. Wolf and F. W. Gage. Columbia Pigments Data Sheet No. 49-1. Columbia Chemical Division, Pittsburgh Plate Glass Co., Pittsburgh 13, Pa. 16 pages. Formulations and test data are given on the use of Calcene T to replace MT black in a natural rubber refrigerator strip compound, FT black in a natural rubber hose tube compound, SRF black in a natural rubber channel compound, and FT black in a natural rubber gasket compound.

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